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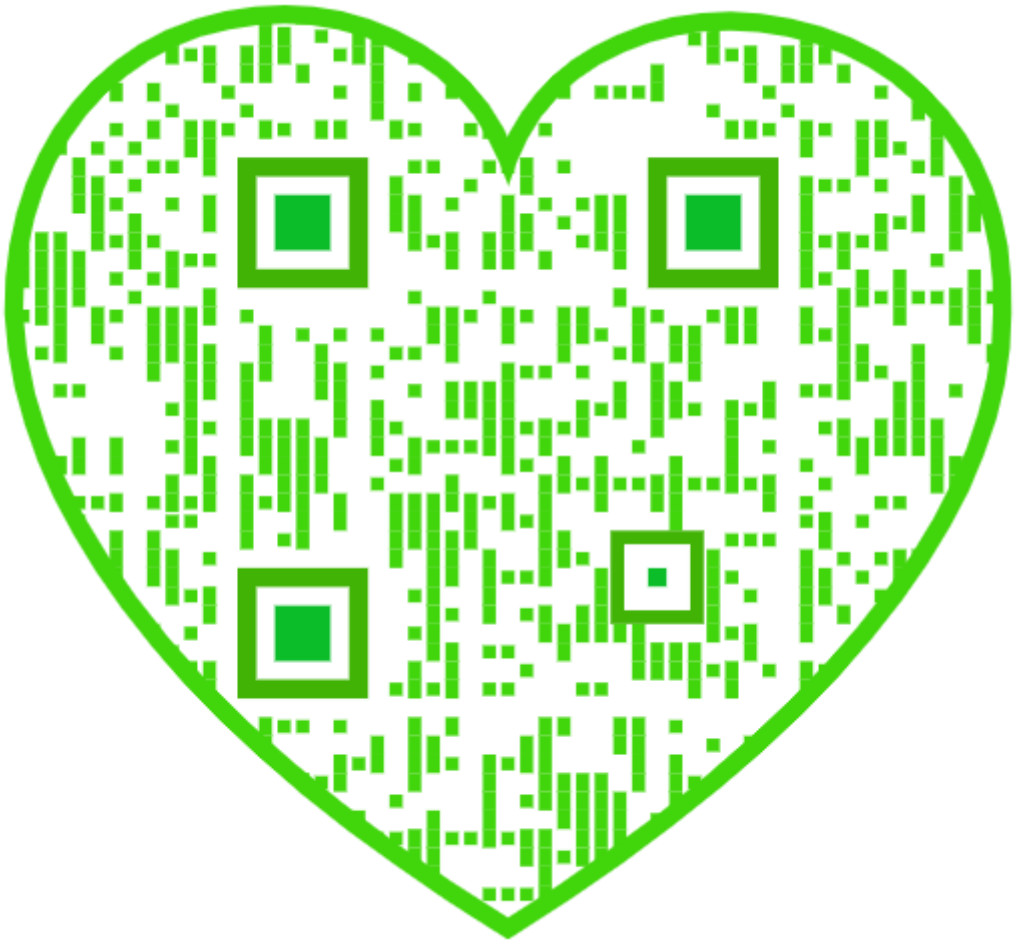

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Corpus luteum of pregnancy: 1, ovary of woman two days after menstruation, showing earliest stages of transformation of a ruptured and bloody Graafian follicle into a corpus luteum; 2, ovary of woman nine days after menstruation: the dark spot is the cicatrix; the surrounding yellow circle is the corpus luteum shining through the transparent tissue; 3, ovary of woman at term of pregnancy, showing corpus luteum with firm white central clot; 4, ovary of woman twenty days after menstruation: besides large fresh corpus luteum are seen two smaller old ones, and Graafian follicles of different sizes (Dalton).

A MANUAL OF

OBSTETRICS

BY

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WITH 163 ILLUSTRATIONS IN THE TEXT,
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PREFACE.

In the preparation of this manual the primary object has been a systematic and rational presentation of the subject of Obstetrics as recognized by the leading teachers of the day. As most conducive to this end, it has been deemed expedient to adopt a combined clinical, physiologic, and pathologic basis upon which to work. Thus, clinically, the vast majority of pregnancies and labors are normal in almost every respect, and *physiologic obstetrics* should most appropriately first command the attention of the accoucheur. Accordingly, a normal pregnancy and labor in a normal woman are depicted from the time of conception to the weaning of the child, at which period the patients naturally pass from the hands of the obstetrician to those of the general physician. In the development of such a history a chronologic sequence of events has been followed as closely as possible, so that the various phases of ovulation, insemination, conception, embryologic and fetal growth and development, maternal alterations and manifestations, the signs and stages of labor, the birth of the child, the retrograde processes of involution, and the establishment of the mammary function, follow each other in a smooth and natural order, as is most desirable in actual practice, and

necessary to ensure a comprehensive review of the performance from a literary point of view.

Unfortunately, however, there is an immense variety of pathologic possibilities that may mar the features of this physiologic process at its successive stages, and these conditions, under the caption of *pathologic obstetrics*, are presented, also in their usual chronologic sequence, in the second and larger portion of the book. Thus, in the various stages of ovular, embryonic, and fetal development, abnormal conditions of the growing structures may be engendered, and either prematurely terminate gestation or be productive of other evident clinical manifestations; the profound alterations in the maternal metabolism consequent upon the unusual condition may readily result in a disturbance of the normal equilibrium of health, and some of the diseases of pregnancy appear, or a grave form of dystocia be developed; the proper disposition of the retrograde substances of involution may fail, or adverse external influences be brought to bear upon the woman during this critical period of her life, and the serious pathologic conditions of the puerperium result; and, finally, the new-born child may present any one of a vast number of morbid conditions requiring active treatment on the part of the accoucheur.

In the evolution of the foregoing system of obstetrics every measure has been adopted that will facilitate the aims of the student of medicine or the busy obstetrician. To ensure ease of reference, a system of paragraphing, italicizing, and numbering has been followed; all unnecessary divisions into chapters and artificial sections have been discarded, and wherever possible carefully selected diagrams and illustrations, many of them new, have been inserted to

still further elucidate the text. All measurements have been given in the metric system, with the English equivalents in parentheses. A large number of diagnostic tables have been formulated and introduced in their proper places, and these constitute a prominent feature of the book; by their aid the various diagnoses may be made with unusual facility, and a comprehension of the stages of the mechanisms of labor becomes a matter of ease.

The recent rapid strides in the knowledge of the pathology of the many morbid states encountered in obstetrics have rendered possible a more scientific classification of these conditions. In this respect especial care has been taken in the preparation of the book. Preeminent among these innovations stands the classification of puerperal sepsis, than which there is no more complicated or obscure subject in obstetrics. Through the labors of the pathologist and bacteriologist a wider knowledge of this disease is now entertained, and there has been offered a classification of the varieties of sepsis based upon their clinical manifestations and pathologic features. Mention should also be made of the grouping of the hemorrhages of pregnancy, of those of the puerperium, and of those of the newborn, as well as of the presentation of puerperal eclampsia, contracted pelvis, and extrauterine pregnancy, in all of which departments especial progress has been made within recent years. In pursuance of the general plan of the book, a rational sequence of the abnormal mechanisms of labor has been adopted, and every possible complication of labor has been noted in its appropriate place. Finally, a complete index with numerous cross-references, and a comprehensive table of contents, add materially to the efficiency of the book.

The author desires to return his most cordial thanks to

Dr. Robert N. Willson for valuable assistance rendered in the reading of the proof-sheets, and to the publisher, Mr. W. B. Saunders, for the care bestowed upon the many details of the publication of the work.

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A Manual of Obstetrics.

PART I. PHYSIOLOGIC OBSTETRICS.

I. THE GENERATIVE ORGANS AND THE PARTURIENT CANAL.

Introductory.—The science of *obstetrics* or *midwifery* may be defined as that branch of the study of medicine pertaining to the care of women in pregnancy, childbirth, and the puerperal state.

Destined as woman has been from the foundation of the world to pass through this period of reproduction and parturition in order to the natural propagation of the race, childbirth should be regarded as an absolutely normal process, as much so as is menstruation or the menopause. It is a function for which she has been especially designed anatomically and physiologically. Her peculiar pelvic conformation, her special and highly functionized generative organs, the provision allotted her for the maintenance of her offspring after birth, and the mental states and emotions that constitute her characteristic maternal instincts,—all unmistakably indicate the noble purpose for which she was created. To the pernicious influences of civilization upon the development of the sexual apparatus and desires alone must be ascribed all those abnormalities of parturition that have done so much to render childbearing an object of terror to womankind, and the subject of obstetrics, and especially of dystocia, one of such uncertainty and appre-

hension to the medical attendant. An investigation of the causes that have led to this deplorable state of affairs, however interesting such a study must be, would far exceed the limits of a volume of these proportions. There are some preliminary considerations, however, that are essential to a thorough comprehension of the physiologic processes concerned in gestation and parturition, and foremost among these stands a knowledge of the anatomic peculiarities of the female genitals. A brief description of these organs will therefore be in order.

The Generative Organs.

The female genitalia include those organs that are concerned in the production and development of the ovum. These have from time immemorial been conveniently divided into (1) the *true* or *internal genitals*, including (*a*) the ovaries (the organs of ovulation) and their ducts (the oviducts or Fallopian tubes), (*b*) the uterus (the organ of development and expulsion), and (*c*) the parturient canal; and (2) the so-called *external genitals* (the vulva).

The ovaries are two small almond-shaped organs situated one on either side of the uterus, and attached to the posterior surface of the broad ligaments. In size the ovary is about 4 cm. (1.5748 in.) long, 2 cm. (0.7874 in.) broad, and 1½ cm. (0.5906 in.) thick, and its average weight is 6.4 grams (100 grains). It consists essentially of two main portions—the *parenchyma* and a fibrous capsule, the *tunica albuginea*. The parenchyma may be subdivided into the *cortex* or *oöphoron*, the free portion of the organ, from which the ova are developed, and the *paroöphoron*, or fibrous portion, imbedded within the layers of the broad ligament, and containing the *hilum*, through which the vascular supply finds entrance.

The oviducts or **Fallopian tubes**, the so-called ducts of the ovaries, are two trumpet-shaped tubes representing the upper ununited extremities of the ducts of Müller. Each

tube extends outward from the upper angle or cornu of the uterus along the superior free margin of the broad ligament. The tube is about 11½ cm. (4.52755 in.) long, and in its course curves around the ovary, so as to envelop that organ to a certain extent. It has an internal opening into the uterine cavity, and an external ovarian or fimbriated extremity, the aperture of which is termed the *ostium abdominale*. The tube is lined with a ciliated cylindric epithelium which is an essential factor in the migration of the ovum after ovulation. By the constant wave-like motion of the cilii from without inward the ovum is carried on toward the uterine cavity.

The uterus or **womb** (Fig. 1, *u*) is a hollow muscular organ occupying a position in about the center of the pelvis and embraced between the folds of the broad ligaments, which extend laterally to either pelvic wall. In the nullip-

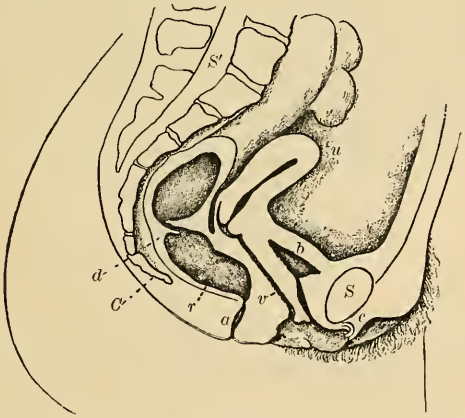


FIG. 1.—Diagram of a supposed mesial section of the pelvis of a living woman: *a*, anal canal; *r*, rectum; *v*, vagina; *c*, clitoris; *b*, bladder when collapsed; *u*, uterus; *d*, valve of rectum (Houston); *S*, symphysis pubis; *S'*, sacrum; *C*, coccyx.

arous adult it is 7⅝ cm. (3.0018 in.) long, 4 cm. (1.5748 in.) broad, and 2⅔ cm. (1.049866 in.) thick. Its weight is about 31 grams (7 drams). Anatomically considered, it may be divided into two main portions, the *body* and the *cervix*,

the constricted portion between the two being the *isthmus.* The upper portion of the body, that above the point of entrance of the Fallopian tubes, is the *fundus uteri;* the portion between the tubes and the internal os is the *body* proper; and that between the internal and the external os is the *cervix.* The anterior surface of the uterus is markedly flattened, and, save at the extreme upper portion, is in close juxtaposition with the bladder; the posterior surface is more convex, and is separated from the rectum by a fold of peri-

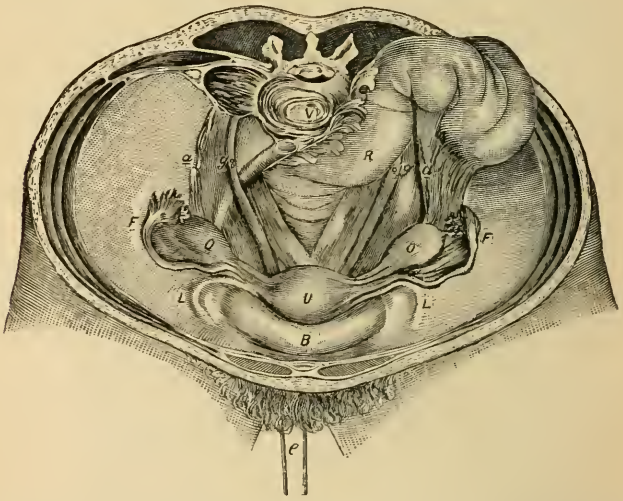


FIG. 2.—View of the pelvis and its organs: B, bladder; U, uterus (drawn down by loop *e*); F, Fallopian tubes; O, ovaries; L, round ligaments; *g*, ureter; *a*, ovarian vessels, often prominent under their peritoneal covering.

toneum constituting *Douglas's pouch* or *cul-de-sac.* At the superior angles or cornua of the body the Fallopian tubes are attached. The *cavity* of the uterus measures about 6½ cm. (2½ in.); it is covered with a pale mucosa lined with cylindric ciliated epithelium. The main bulk of the uterus is composed of unstriped muscular tissue disposed in three layers. It is lined within by the mucous coat, and

without by the serous or peritoneal coat. Of the three layers of muscular tissue, the inner is mainly sphincteric in nature; it is largely disposed in the vicinity of the internal os and around the orifices of the Fallopian tubes. The fibers of the outer layer extend longitudinally, and in labor assist materially in dilating the cervix and retracting it over the fetal presentation. The middle layer of obliquely-disposed fibers constitutes the main bulk of the muscle and is the most active portion in parturition.

From an obstetric point of view the uterus may be divided into the upper and lower segments, separated by the *con-*

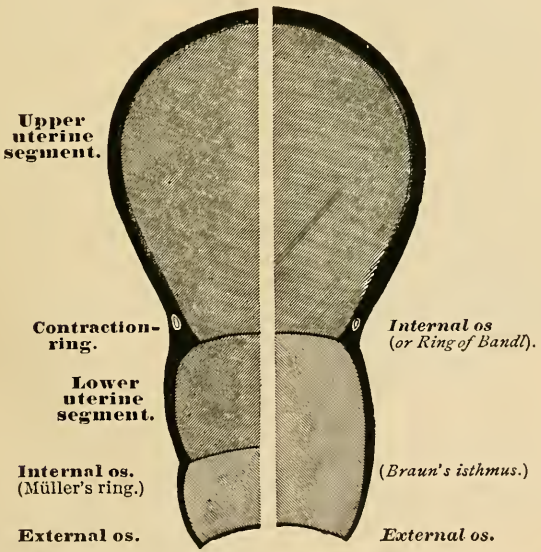


FIG. 3.—Diagram illustrating the two teachings concerning the lower uterine segment and the cervix. On the left side an internal os has been added for the sake of clearness, although in the frozen sections of women with full dilatation it is rarely apparent macroscopically (one-third natural size).

traction-ring of Bandl, and the cervix. The *upper uterine segment* embraces all that portion of the uterus that becomes actively engaged in the expulsion of the fetus. It is limited below by Bandl's ring, which in pregnancy at

term is approximately about 12 to 15 cm. (5 or 6 in.) above the internal os, or about the point of attachment of the peritoneum to the uterus, and holds a position at a level with the pelvic brim. The *lower uterine segment* (Fig. 3) is that portion of the uterus that remains passive during labor and undergoes dilatation. It extends between Bandl's ring above and the upper portion of the cervix below.

The Parturient Canal (Fig. 4).—The passage-way through which the fetus, mature or immature, makes its entrance into the world. It includes: 1. The lower uterine segment; 2. The vagina; 3. The pelvis. It terminates below in the vulva.

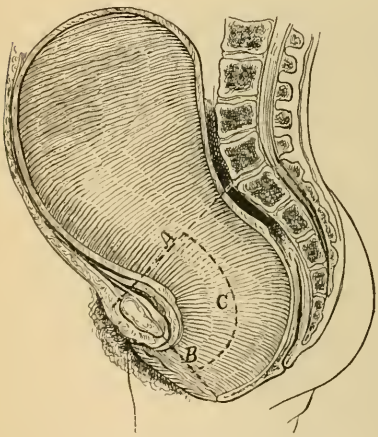


FIG. 4.—General axis of the parturient canal, including the uterine cavity and the soft parts: *A*, center of superior strait; *B*, center of inferior strait; *C*, center of the pelvic cavity.

The vagina, or *sheath*, confined entirely within the true pelvis, is the organ of copulation, and is the passage extending obliquely upward, at about an angle of 60° to the horizon, from the vestibule of the vulva below to the cervix above; the latter protrudes into the lumen of the vagina for a short distance. The space in front of the cervix is called the *anterior vaginal vault;* that behind the cervix, the *posterior vaginal vault.* The vagina is composed of two walls, anterior and posterior, which are normally in contact; the anterior wall is about 6½ to 7 cm. (2.5590 to 2.7559 in.) long, the posterior 7⅝ cm. (3.0018 in.). The mucous surface of the vagina is thrown into pronounced transverse folds or rugæ, which are most marked in virgins. During labor the vagina dilates to permit of the passage of

the fetus. The *hymen* is a fold of the vaginal mucosa guarding its lower orifice, the *introitus vaginæ*.

The Vulva.—The external genitals, or *vulva* (Fig. 5), comprise the labia majora and minora, the clitoris, the vestibule, the fossa navicularis, and the mons veneris.

The *labia majora*, the analogue of the scrotum in the male, consist of two thick folds of integument extending for about 7⅝ cm. (3.0018 in.) from the symphysis pubis above to their junction below—the *posterior commissure*, or *fourchet*—about 2½ cm. (1 in.) in front of the anus. In structure they are composed of adipose tissue, blood-vessels, and nerves, with an internal mucous and an external cutaneous surface, the latter being clothed with short, crisp hairs. *Bartholini's glands*, or the glands of Duverney or of Huguier, one on either side, are imbedded in the lower third of the labia majora. The *rima pudendi* is the fissure separating the labia. The fourchet is torn in the majority of labors occurring in primiparæ.

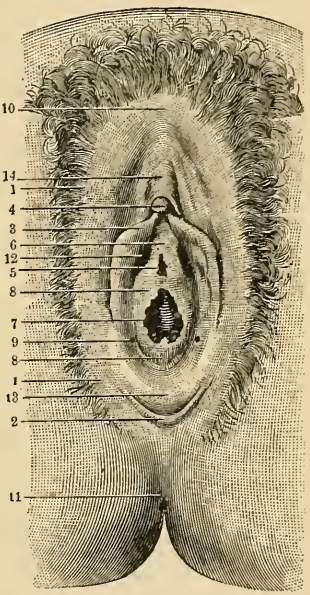


FIG. 5.—Virginal vulva: 1, labia majora; 2, fourchet; 3, labia minora; 4, glans clitoridis; 5, meatus urinarius; 6, vestibule; 7, entrance to the vagina; 8, hymen; 9, orifice of Bartholini's gland; 10, anterior commissure of labia majora; 11, anus; 12, blind recess; 13, fossa navicularis; 14, body of clitoris (modified from Tarnier).

The *labia minora*, or *nymphæ*, are two small mucous folds situated within the greater lips, and uniting above to form the *prepuce* of the clitoris. They extend downward to about the middle of the labia majora, where they merge into the latter. A large number of sebaceous glands are found on their surfaces.

The *clitoris* is the analogue of the penis in the male. Like the latter, it is composed of two corpora cavernosa, which end distally in a rounded extremity, the *glans clitoridis*. It is situated about 1¼ cm. (0.492125 in.) below the union of the labia majora above. From its large nerve-supply it is believed to be the seat of sensual pleasure.

The *vestibule* is the triangular space bounded above by the clitoris, laterally by the labia minora, and below by the orifice of the vagina. The urethra and a number of mucous glands open into this space.

The *fossa navicularis* is the triangular space seen when the labia majora are separated below. It is bounded above by the vaginal orifice, below by the fourchet, and laterally by the labia majora.

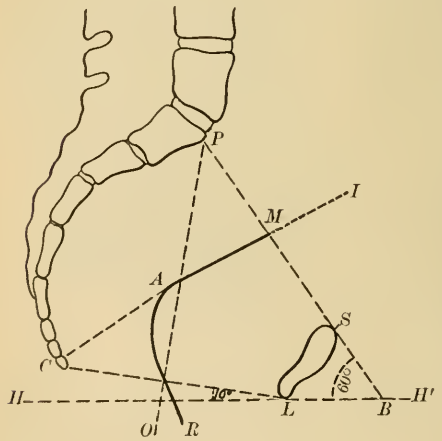


FIG. 6.—Axes of the pelvis: *P*, promontory of the sacrum; *C*, coccyx; *S*, symphysis pubis; *I*, umbilicus; *P S*, plane of the superior strait; *C L*, plane of the inferior strait; *H H'*, line of the horizon; *I M A*, axis of the superior strait; *A R*, axis of inferior strait; *M A R*, curve of Carus; *P B L*, obliquity of superior strait; *C L H*, obliquity of the inferior strait.

The *mons veneris* is an eminence above the symphysis pubis composed mainly of adipose tissue and skin. It serves as a cushion during copulation.

The Bony Pelvis.—The pelvis is a basin-shaped bony canal situated at the base of the trunk of the body; it rests upon the femora and supports the vertebral column. It is composed of four bones—the two innominate or hip-bones, the sacrum, and the coccyx. It is divided by the iliopectineal lines into an upper and a lower portion, known respectively as the *false*

and the *true* pelvis. The relationship which the pelvis holds to the trunk above and to the extremities below is known as its *position* or *obliquity* (Fig. 6); thus, the angle formed by the plane of the superior strait with the horizon varies from 50° to 60°, and that formed by the plane of the inferior strait and the horizon is about 10°. This obliquity is not a fixed factor, but varies with the position of the patient: it is almost entirely obliterated when the sitting or stooping posture is assumed. The parturient canal is somewhat shortened in this position; hence the advantage of having the patient draw up the limbs during labor.

The *false pelvis* obstetrically has no function other than that of favoring the engagement of the fetus in the superior strait. It provides the inclined plane, directed mainly from behind forward, down which the fetus will descend under the impulse of the uterine contractions.

The True Pelvis.—Laterally the two iliopectineal lines, and posteriorly the base of the sacrum, form the upper limit of the true pelvis (Fig. 7). This cordate margin is termed

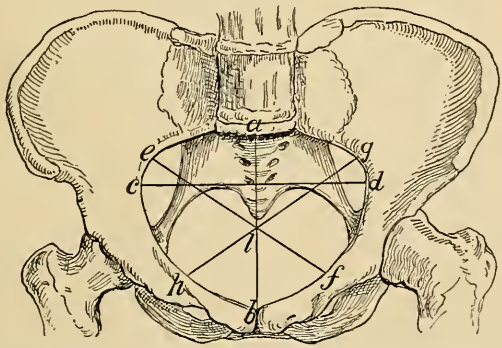


FIG. 7.—Female pelvis, one-third natural size, showing form and diameter of brim or inlet: *ab*, anteroposterior or conjugate diameter; *cd*, transverse diameter; *ef*, right oblique diameter; *gh*, left oblique diameter.

the *inlet* or *superior strait.* Its most important measurement is the *anteroposterior*, *conjugate*, or *sacropubic diameter*,

extending between the central points of the upper margin of the symphysis pubis and the promontory of the sacrum (~~11 cm. or 4.3307 in.~~). The *transverse* or *bisiliac diameter* joins the central points of the two iliopectineal lines; it measures 13½ cm. (5.3150 in.). The *oblique diameters* measured from either iliopectineal eminence to the opposite sacroiliac synchondrosis are each 12¾ cm. (5.0196 in.) in length. Accurately, the right oblique diameter (that extending from the left iliopectineal eminence to the right sacroiliac synchondrosis, and corresponding to the right hand of the obstetrician when he faces the patient) is a trifle longer than the left, even in the dried pelvis. The circumference of the brim is about 40 cm. (15.7480 in.). Its axis, or an imaginary line drawn perpendicular to the center of the strait, if extended would pass through the umbilicus above and the tip of the coccyx below.

The *cavity* of the pelvis is the space between the superior and inferior straits. It is larger above than below, thus continuing the downward inclination begun above in the false pelvis. By the jutting outward of the two ischial spines, one on either side, there are formed two general inclined planes, an anterior and a posterior, the latter being more prominent. By this arrangement the presenting fetal part is by some supposed to be directed forward toward the vulvar orifice by a process of internal rotation. The depth of the pelvis anteriorly through the symphysis pubis is 4 to 4½ cm. (1.5748 to 1.7716 in.); laterally from the iliopectineal line to the ischial tuberosities, 9 to 9½ cm. (3.5433 to 3.7401 in.); and posteriorly down the sacrum and coccyx 12⅔ cm. (4.9869 in.). The axis of the pelvic cavity or canal, also termed the *curve* or *circle of Carus*, is an imaginary line extending from the middle point of the plane of the superior strait downward to the middle point of the plane of the inferior strait, at all points being equidistant from the pelvic walls. The intensity of this curve depends upon the degree of curvature of the sacrum. This line

represents the path followed by the fetus during parturition (see Fig. 6).

The *inferior strait* or *outlet* (Fig. 8) of the pelvis is likewise cordate in shape, but this is subject to variation, owing

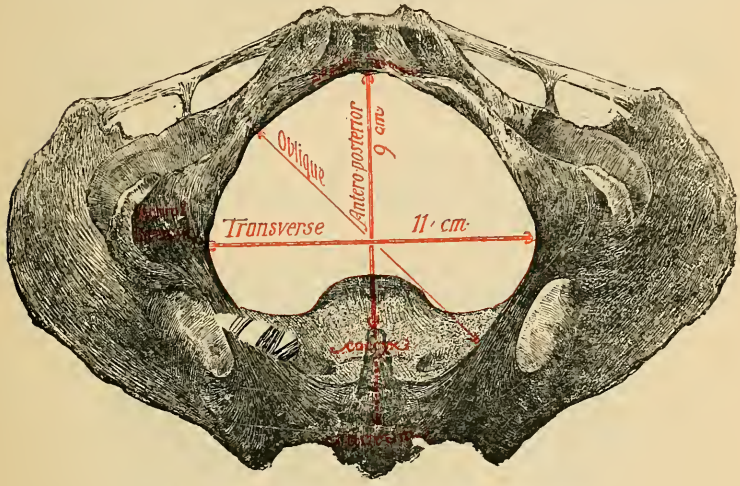


FIG. 8.—Diameters of the pelvic outlet (Dickinson).

to the movability of the coccyx, so that during labor it becomes almost circular. Its boundaries are the pubes, the rami of the pubes and ischium, the tuberosities of the ischium, the sacro-sciatic ligaments, and the coccyx. The diameters of this strait are—the *anteroposterior*, *conjugate*, or *coccypubic*, measured from a line dropped perpendicularly from the lower border of the symphysis pubis to the tip of the coccyx, 9½ cm. (3.7401 in.), increasing to 11 cm. (4.3307 in.) in labor, the coccyx being displaced backward 1½ cm. (.5906 in.); the *transverse* or *bisischiac*, extending between the inner borders of the tuberosities of the ischia, 11 cm. (4.3307 in.); and the *oblique*, measured from the junction of the descending pubic ramus and ascending ischial ramus of one side to the center of the greater sacro-

sciatic ligament of the opposite side, 12¾ cm. (5.0196 in.). The axis of the outlet, if extended, would pass through the promontory of the sacrum above.

The Pelvis in Life.—The space within the bony pelvis is considerably diminished by the disposition of the soft structures found therein. These consist of ligaments, fascia, muscles, bowel, bladder, vessels, and nerves, and upon their presence depend many of the phenomena of the mechanism of labor.

The *ligaments* of the pelvis (Fig. 9) are as follows: 1. Those joining the sacrum with the iliac bones, the *anterior*

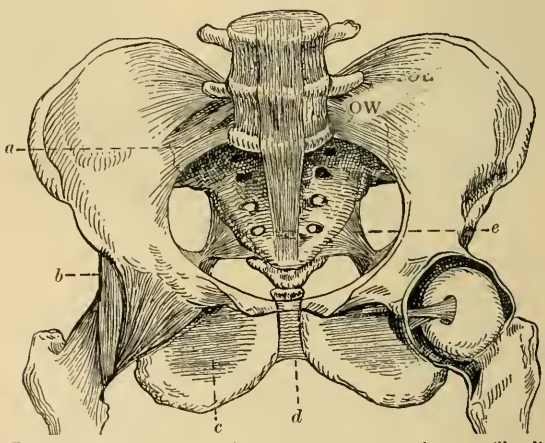


FIG. 9.—Front view of the pelvis, with its ligaments: *a*, anterior sacroiliac ligament; *b*, iliofemoral ligament; *c*, obturator membrane; *d*, symphysis pubis; *e*, sacrosciatic ligament.

and *posterior sacroiliac ligaments*, two of each; 2. Those connecting the sacrum and the coccyx, the *anterior*, *posterior*, and *lateral sacrococcygeal ligaments;* 3. Those joining the two pubic bones, the *anterior*, *posterior*, and *superior pubic* and the *subpubic ligaments;* 4. Those connecting the sacrum and the coccyx with the ilia and the ischia, the two *greater* and two *lesser sacrosciatic ligaments*, the *greater* ex-

tending from the tubercles of the sacrum to the tuberosity of the ischium, and the *lesser* from the lateral margin of the sacrum to the same point. These ligaments are important as still further modifying the shape of the pelvis and the direction of its axis, and, in labor, as serving as buffers for the fetal presentation.

The *muscles* of the pelvis include those of the canal and those of the pelvic floor, and these have somewhat distinct

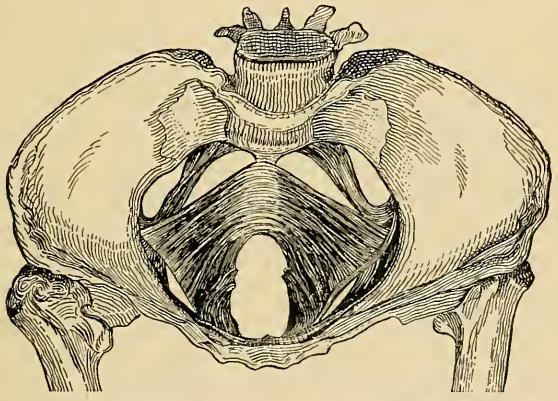


FIG. 10.—The levator ani muscle as seen from above, with the tendinous arch that spans the obturator muscle.

obstetric functions. Those of the *canal*, including the coccygeus, pyriformis, and iliopsoas posteriorly and the obturator internus anteriorly, serve to turn the presenting part into the most favorable diameter for its expulsion, and also act as cushions upon which the fetus may rest and escape injury from undue pressure. Owing to the presence of these muscles (the iliopsoas in particular), the transverse diameter of the superior strait becomes smaller than the oblique; hence the frequency of oblique fetal positions whatever the presentation. It has been ascertained that these muscles diminish the transverse diameter by about 1½ cm. (0.5906 in.), and the congugate by 1 cm. (0.3937

in.). The *muscles of the pelvic floor* are, from without inward, the transversus perinei, the ischiocavernosus, the sphincter ani, the sphincter vaginæ, the coccygeus, and the levator ani (Fig. 10). Their functions are primarily to support the pelvic viscera, and obstetrically to complete the direction of the pelvic canal, and to direct, by the pressure they exert, the fetal presentation toward the vulvar orifice. The most important muscle of the pelvic floor is the levator ani, a powerful structure extending backward and inward from its origin on the body of the pubis near the symphysis, and sending off branches behind the vagina and around the rectum. In difficult labor or when the perineum is unduly rigid this muscle is torn through, and the condition known as a lacerated perineum results.

The *pelvic fascia* is in direct communication with the fasciæ of the thighs and perineum and with the abdominal subcutaneous tissue. It may therefore serve as an avenue for peritoneal infection following lesions of these external surfaces, the morbific agent infecting rapidly the lymphatic tissue in the course of the fascia. Thus, the septic process beginning in the vagina, urethra, or rectum may extend to the peritoneum by direct continuity of tissue, and the patient be exposed to the dangers of puerperal pelvic cellulitis or peritonitis. The very rich vascular and lymphatic supply of the pelvis renders all such septic processes exceptionally virulent. Hemorrhages into the interstitial spaces also follow the distribution of the pelvic fascia.

The situation of the *rectum* to the left side of the pelvis is an important determining factor in the position of the presenting part. By its presence the left oblique diameter of the superior strait is still further impinged upon, and the presenting fetal part is compelled to find the necessary room in the right oblique diameter; hence another cause for the frequency of oblique presentations.

Pelvimetry.—As some of the most serious forms of dys-

tocia arise from irregularities in the pelvic conformation, it becomes essential to determine what are the normal pelvic relations and measurements. Hence has arisen the science of *pelvimetry*, or the measurement of the pelvis in the living woman. These measurements are secured by means of a special instrument, the pelvimeter, or by the fingers (when the process is termed *digital pelvimetry*), certain fixed points of the bony pelvis being taken as the guiding-points. The *pelvimeter* in its common form resembles a pair of calipers to which is attached a scale graduated according to the metric system. The instruments of Baudelocque (Fig. 11) and Duncan are probably the most familiar. The measurements may be made *externally* and *internally*, or by the *combined* method; the external measurements, however, are but approximately accurate on account of the varying degrees of stoutness and osseous development.

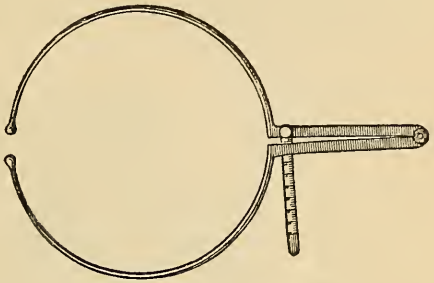


FIG. 11.—Baudelocque's pelvimeter.

Estimation of the Pelvic Inlet.—The four fixed points of the pelvic inlet—namely, the two iliopectineal eminences anteriorly, and the two sacroiliac synchondroses posteriorly—are essential elements in the estimation of the size of the upper pelvic diameters, and also in determining the position of the fetal presentation. They have been termed the *cardinal points of Capuron.* The most important diameter of the pelvic inlet is the *anteroposterior* or *conjugate* (*conjugata vera*), for the reason that it is this diameter that is most commonly shortened in deviations from the normal in the contour of the pelvis. The size of this diameter may be estimated by taking three measurements, two

internally and one externally. The *external measurement* is taken by placing one arm of the pelvimeter upon the upper edge of the symphysis pubis, and the other arm upon the

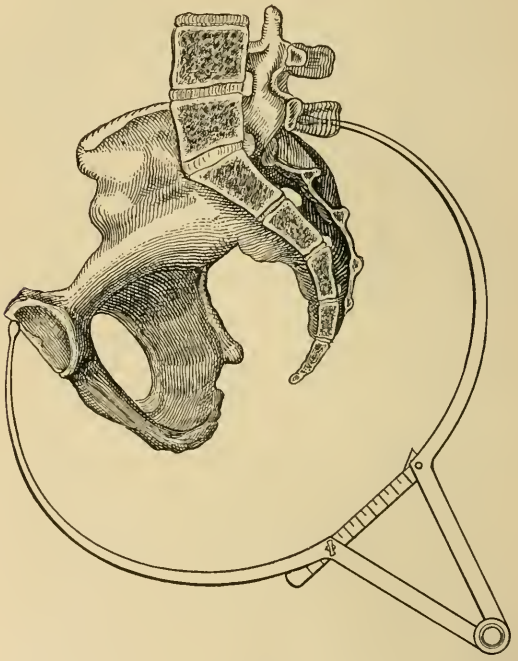


FIG. 12.—Baudelocque's pelvimeter: method of taking the external conjugate diameter of the inlet.

~~depression under the~~ spine of the last lumbar vertebra (Fig. 12), about 2½ cm. (0.98425 in.) above the transverse line joining the posterior superior iliac spines, the patient resting upon her side. This diameter, which is called the *external conjugate*, or the *diameter of Baudelocque*, measures normally ~~20¼ cm.~~ (7.9724 in.), which is 9¼ cm. (3.6417 in.) more than the true conjugate diameter of the pelvis. Hardie's measurement is also made externally, but is not practical on account of its inaccuracy and the limited period of gestation (the first

trimester only) during which it can be employed; it can only be taken in women who are not obese. The patient resting in the lithotomy position, the fingers are placed about 2½ cm. (.98425 in.) below the umbilicus, and pressure backward is made until the sacral promontory may be felt; the distance from the promontory to the top of the symphysis is measured, and an approximate idea of the size of the pelvic inlet is obtained.

The *internal measurements* are the *sacrocotyloid diameter*, extending from a point immediately above the center of the acetabulum to the promontory of the sacrum (9¼ cm. or 3.6417 in.), and the *internal* or *indirect conjugate diagonal.* The latter measurement is taken by the hand in the vagina (Fig. 13), the tip of the middle finger resting against the

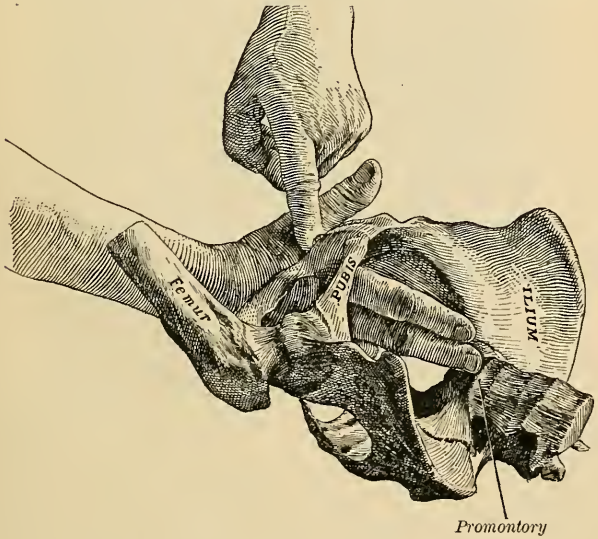


FIG. 13.—Manual method of measuring the diagonal conjugate.

promontory of the sacrum; the distance between the tip of this finger and the point on the radial border of the hand in

contact with the under surface of the symphysis, the subpubic ligament, is the conjugate diagonal (12¾ cm. or 5.0196 in.); it is 1¾ cm. (0.691475 in.) greater than the true conjugate. To avoid the errors in this measurement consequent upon the variations in the length of the symphysis and the size of the conjugatosymphyseal angle (that between the top of the symphysis and the true conjugate of the superior strait), a better and more direct method is that recently suggested by Professor Barton Cooke Hirst of the University of Pennsylvania. This consists in measuring from the promontory of the sacrum to the upper outer edge of the symphysis pubis (Fig. 14); the thickness of the symphysis

Fig. 14.—Measuring the true conjugate plus the thickness of the symphysis (Dickinson).

alone must then be deducted in order to ascertain the true conjugate diameter (Fig. 15). For this purpose Dr. Hirst has devised a special form of pelvimeter modelled after the instrument of Skutsch, but considerably improved.

The *transverse diameter* of the inlet may be estimated by one internal and four external measurements. The external

measurements are the *anterior interspinous diameter*, or the distance between the anterior superior iliac spinous processes

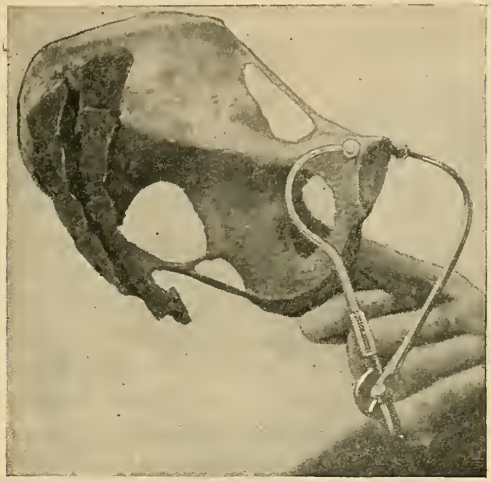


FIG. 15.—Measuring the thickness of the symphysis (Dickinson).

(26 cm. or 10.2362 in.), the *posterior interspinous diameter*, or the distance between the posterior superior iliac spinous processes (8½ to 9 cm. or 3.35745 to 3.5433 in.), the *intercristal diameter*, or the distance between the middle points of the iliac crests (29 cm. or 11.4173 in.), and the *intertrochanteric diameter*, or the distance between the two major trochanters (31 cm. or 12.2047 in.). The internal measurement is *Löhlein's*, or the so-called *internal ascending oblique diameter*, which is of but minor importance in the estimation of the pelvic diameter; it is the distance from the central point of the subpubic

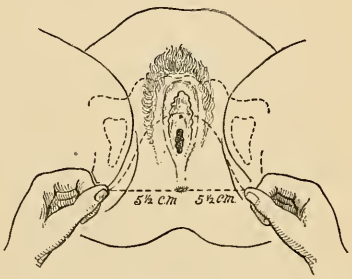


FIG. 16.—Chantreuil's method of pelvic measurement.

ligament to the upper and anterior margin of the great sacrosciatic foramen; this is 2 cm. (0.7874 in.) shorter than the transverse diameter. The *oblique* or *diagonal diameters* of the pelvis measure 22 cm. (8.6614 in.). They are *right*

FIG. 17.—Male pelvis seen from the front (Dickinson).

and *left*, and extend from one anterior superior spinous process of the ilium to the opposite posterior superior spinous process, which may be recognized by the distinct indentation overlying it. This measurement is taken with the patient resting upon her side. .The circumference of the pelvis at the upper margin is 90 cm. (35.4330 in.).

Estimation of the Pelvic Outlet.—Only in one common variety of pelvic deformity is this portion of the pelvis contracted—namely, in the kyphotic pelvis. Therefore but slight import is attached to the measurements here. In the normal pelvis the *transverse* or *bisischiac* diameter—the most important, pathologically considered—measures 11 cm. (4.3307 in.), and it may be determined by the *method of*

Chantreuil (Fig. 16), in which, the patient resting upon her knees and elbows or in the lithotomy position, the thumbs are placed upon the ischial tuberosities and the intervening distance is accurately measured by an assistant.

FIG. 18.—Female pelvis seen from the front, one-third natural size (Dickinson).

The Male and the Female Pelvis Compared.—When a male pelvis (Fig. 17) and a female pelvis (Fig. 18) are viewed together, some striking points of difference may be recognized. These rest upon modifications in the female pelvis dependent upon the generative function. In the following table are grouped the most prominent points of distinction:

Points of Difference between the Male and the Female Pelvis.

Female.	*Male.*
Structure is light.	Structure is heavier.
Cavity is shallow, but roomy; iliac bones are widely separated.	Cavity is deep and contracted; iliac bones are closer together.
Sacrum is wide and deeply curved; there is moderate projection of the prominence.	Sacrum is narrow and slightly curved; there is deep projection of the prominence.
Ischial tuberosities are widely separated.	Tuberosities are more closely approximated.
Subpubic angle ranges from 90° to 100°.	Subpubic angle ranges from 75° to 80°.
Pelvic brim is elliptic or cordate.	Pelvic brim is triangular.
There is great pelvic inclination.	There is slight pelvic inclination.
Thyroid foramen is triangular.	Thyroid foramen is oval.

II. PUBERTY AND ITS MANIFESTATIONS.

Having described the ovary anatomically, it remains, before entering into a study of gestation and its phenomena, to elucidate the egg-bearing function of this organ, known technically as *ovulation*.

The Ovisacs, or Graafian Follicles (Fig. 19).—Scattered thickly throughout the oöphoron, or active ovarian stroma, may be noted numerous small round vesicles in various stages of development, known as the *Graafian follicles*. They number many thousands in each ovary; as they mature they increase in size and approach the surface

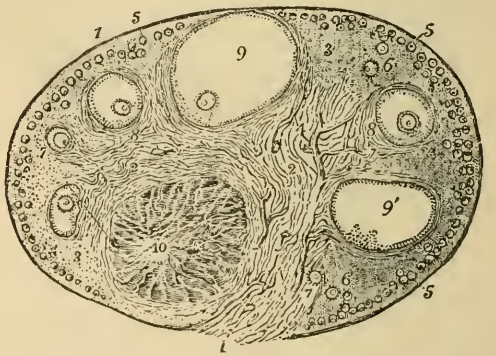


Fig. 19.—Section of the ovary of a cat, enlarged six times: 1, outer covering and free border of the ovary (epithelium and albuginea); 1′, attached border; 2, vascular zone, or medullary substance; 3, parenchymatous zone, or cortical substance; 5, Graafian follicles in their earliest stages, lying near the surface; 6, 7, 8, more advanced follicles, imbedded more deeply in the stroma; 9, an almost mature follicle, containing the ovum in its deepest part; 9′, a follicle from which the ovum has accidentally escaped; 10, corpus luteum (Schrön).

of the ovary, where they rupture and discharge their contents. The adopted theory of the formation of the ovisacs is that of Pflüger and other German writers: it is that there occurs in fetal life an invagination of portions of the epithelial covering of the ovary in long processes known as *egg-cords*, or the *cords* or *loops of Pflüger*, and the epithe-

lial cells thus invaginated undergo extreme specialization and develop into the ovisacs, each of which contains an ovum. Anatomically, a Graafian follicle is composed of the following elements: Externally is the *tunica fibrosa* or *vasculosa*, a fibrous membrane composed mainly of vascular connective tissue; next, the *tunica propria*, composed of simple connective tissue, lined by the *membrana granulosa*, which consists of columnar nucleated cells. At the point of attachment of the ovum to the membrana granulosa there is an accumulation of the cells of the latter structure, forming the *discus* or *cumulus proligerus*. The cavity of the ovisac contains the *ovum* and a transparent viscid fluid, the *liquor folliculi*.

The Ovum.—The vital element or reproductive cell of the female, varying in size from $\frac{1}{150}$ to $\frac{1}{120}$ of an inch, is termed the *ovum*. It consists of a protoplasmic *yelk* or *vitellus* and a *nucleus* or *germinal vesicle* (*vesicula germinativa*) enclosed within a hyaline covering, the *zona pellucida* or *vitelline membrane*.

An examination of the vitellus reveals two constituents—namely, a solid substance, the *spongioplasm*, existing as a delicate reticulum, in the meshes of which is a more fluid substance, the *hyaloplasm*. Within the germinal vesicle, either centrally or peripherally situated, is a minute dark point known as the *germinal spot* (*macula germinativa*), which is the active generative portion of the ovum. It is surrounded by the nuclear fluid.

Ovulation.—By this term is meant, in its fullest sense, the formation, development, and discharge of a mature ovum from the ovary. Until puberty the Graafian follicles remain in a state of quiescence. Upon the establishment of puberty, however, certain of the follicles assume extraordinary growth and rapidly approach the ovarian surface. One of these follicles reaches its full maturity about the time of a menstrual epoch, and under the impulse of certain determining causes it ruptures and discharges its

contents—namely, an ovum, with the liquor folliculi and a few cells of the discus proligerus. *Causes of Rupture of the Follicle.*—Nothing positive is known as to just why a mature follicle ruptures. Certain plausible theories have been suggested, as follows: 1. Absorption and attenuation of the theca folliculi, due to increased intrafollicular pressure from accumulation of fluid within the follicle; 2. Extravasation of blood into the sac; 3. Exaggerated growth of the membrana granulosa, with liquefactive changes in its cells, resulting in undue softening thereof; 4. Periodic contraction of the ovarian stroma; 5. The excitement and local congestion consequent upon coition. *Relationship existing between Ovulation and Menstruation.*—The exact time of the discharge of the ovum—that is, whether it takes place before, during, or after the appearance of the menstrual discharge—is still *sub judice;* it is quite generally believed, however, that ovulation occurring at the menstrual period takes place just prior to the onset of the menstrual flux. While usually coexistent, ovulation and menstruation may occur independently of one another, an ovum being discharged midway between two menstrual epochs. *Ultimate Disposition of the Ovum.*—The escaped ovum being received into the Fallopian tube either by direct introduction at the time of rupture or by suction, according to Henle's theory, it is carried into the uterine cavity by the action of the ciliated epithelium of the tube. Here it is lost in the menstrual flux, or, having become impregnated, finds lodgement and develops into the product of conception. This change in location is known as the *migration of the ovum.* It is probable that in many instances the ova fail to gain entrance into the oviduct, and are lost in the peritoneal cavity, where they become absorbed. Curious instances are on record in which an ovum, escaping from a given ovary, has failed to enter the corresponding Fallopian tube, probably on account of some diseased condition of the latter, but, crossing the uterine

fundus, has gained admission into the opposite tube, and thence proceeded into the uterus. This is known as *external migration* of the ovum.

The Corpus Luteum.—The ruptured follicle after the discharge of the ovum undergoes a series of retrograde changes, resulting in the formation of a scar known as the *corpus luteum* or yellow body (see *Frontispiece*). The cavity fills with blood, which in time undergoes organization, becoming yellowish in color, and finally being transformed into true fibrous tissue. This contracts and a permanent cicatrix results. The size of this cicatrix and the time required for its formation vary according to the degree of congestion of the ovary. Should pregnancy result or should there exist some pathologic condition, as a chronic ovaritis, a septic pelvic peritonitis, or marked uterine disease (*e. g.* the presence of uterine fibroids), the corpus luteum will be increased in its dimensions, and before complete cicatrization can be accomplished three or four months may elapse instead of the whole process being completed in as many weeks. The former belief in the medico-legal value of the size of the corpus luteum in the determination of the existence of pregnancy has been proved fallacious.

Puberty.—Puberty is the period of sexual maturity in a child, at which time, in the female, fecundation becomes possible. The *age* at which puberty takes place is governed by several well-recognized determining factors. These are *race*, *social development*, *climatic influences*, and *family predisposition*. In this country the average age is about the fourteenth year, while in warmer climates puberty may occur much earlier. The *signs of puberty* in the female are—1. The appearance of hair upon the pubes; 2. The development of the breasts; 3. The establishment of the function of ovulation; 4. The appearance of menstruation; 5. The widening of the pelvis; 6. The growth of the sexual sense.

Menstruation.—Menstruation is that periodic series of

phenomena occurring normally every twenty-eight days in the non-pregnant female from puberty to the menopause, and consisting principally in a congested state of the uterine and tubal mucosæ, which is attended by sundry systemic and psychic manifestations and is followed by a discharge of a sero-sanguinolent fluid from the genital canal, known as the *menses, flow*, or *menstrual flux*. This fluid is composed mainly of altered blood containing portions of desquamated mucosal cells mixed with the normal uterine and vaginal secretions; it is alkaline in reaction, with a faint, peculiar and somewhat disagreeable odor, and, because of its admixture with mucus, does not undergo coagulation. It is derived from the congested mucosæ of the tubes and uterus, the distended vessels permitting a leaking of the blood through their attenuated walls, according to the view advanced by Leopold. The usual *duration* of the menstrual flux is three or four days, and the total amount normally lost is from 148 to 295.73 c.cm. (5 to 10 ounces); this may be estimated by the number of napkins soiled, usually two or three daily. The symptoms attendant upon the appearance of menstruation are termed the *menstrual molimina*. They include pelvic congestion, as manifested by vague pains and a sense of discomfort in the back and lower abdominal region; pigmentation of the skin, especially noted around the eyes; swelling of the breasts with milk-formation; frequent pulse-rate; and enlargement of the tonsils and other glandular structures of the neck, often producing a huskiness of the voice. It is believed that the object of the menstrual flow is to make ready a nidus for the impregnated ovum.

The menopause, *climacteric*, or *change of life* occurs about the middle of the fifth decade, and consists in a gradual diminution in the frequency and amount of the menstrual flow, and ultimately in a complete cessation. This, as has been said, usually occurs about the forty-fifth year, but may be delayed much longer, even beyond the

sixty-fifth year; or it may appear sooner, the menstrual function being, in certain recorded cases, abolished as early as the twenty-fifth year. Thirty years of sexual activity is considered the normal duration. There are some marked changes consequent upon the arrest of this physiologic process. Not only do all the genitalia undergo an atrophic change, but nervous manifestations appear, and the woman for a period of some months will suffer from the characteristic *flashes of heat*, together with alterations, slight or pronounced, in disposition and physical constitution. There is a more or less constant tendency to obesity at this time.

III. PREGNANCY OR GESTATION.

Insemination; Conception; Embryologic and Fetal Development.

In order that there may be a propagation of the race it is necessary that there be brought about a union of the vital elements of the two sexes. This is accomplished by means of *coition* or *copulation*. During sexual intercourse there is deposited by the male organ within the vagina a peculiar fluid, the *semen*, containing the vitalizing element. This act is termed *insemination*. Now, insemination is not necessarily followed by impregnation. In order that the woman shall conceive there must be a meeting and amalgamation of the male and female elements. When such an amalgamation occurs the ovum is said to be *fertilized* or *fecundated;* the woman *conceives* or is *impregnated*, and enters upon the period of *pregnancy* or *gestation*. A *nulliparous* woman, or a *nullipara*, is one who has never borne a child, and this condition of non-productiveness is termed *nulliparity*. *Parity* is the condition of being able to bear children, and when a woman becomes pregnant for the first time she enters the state of *primiparity*, and is termed a

primiparous woman, a *primipara*, or a *primigravida;* in subsequent pregnancies she is said to be in the state of *multiparity*, and is termed a *multiparous* woman, a *multipara*, or a *multigravida*. It has hitherto been the custom to designate the different degrees of parity by Roman numerals: thus, a primipara has been designated Ipara; a woman in her second pregnancy, IIpara; one in her third gestation, IIIpara; and so on. Recently Dr. George M. Gould of Philadelphia has very appropriately suggested substituting for these "unpronounceable monstrosities" the following terms: For a woman in her second pregnancy, *duipara* (*deutipara* or *secundipara*); in the third, *tripara* (or *tertipara*); in the fourth, *quadripara;* in the fifth, *quintipara;* in the sixth, *sextipara;* in the seventh, *septipara;* in the eighth, *octipara;* in the ninth, *nonipara;* in the tenth, *decipara*, and so on. This terminology will be employed throughout this work.

The Semen.—The semen is a thick, viscid, yellowish or opalescent fluid, with a faint, characteristic, lime-like odor, discharged by the male at the height of the orgasm. It is the secretion of the testicles in combination with the secretions of the prostate and Cowper's glands. It is composed mainly of the liquor seminis, the seminal granules, and the spermatozoa or vital elements. The *liquor seminis* is a highly albuminous fluid holding in solution an odoriferous, mucilaginous body, *spermatin*, together with phosphates, chlorids, and other inorganic substances. Its most important constituents are the *spermatozoa* (Fig. 20). These are microscopic, tadpole-like bodies present in immense numbers, and derived from the sperm-cells of the seminal tubules of the testicles; they are about $\frac{1}{500}$ of an inch in length. Each spermatozoön consists of a flat, oval head, a small body, and an immensely

FIG. 20.—Spermatozoa: *h*, apparent nucleus; *b*, body; *t*, tail.

elongated and tapering tail or flagellum, which, in the living spermatozoön, is in constant motion, and which imparts motility to the entire organism. When this faculty of locomotion is lost the spermatozoid no longer possesses the vitalizing power. The length of time that vitality is retained depends largely upon the environment. The spermatozoa may still possess full fertilizing power within the female genitalia a week after insemination. An excessively acid or alkaline leukorrhea will destroy them, as will also exposure to extreme degrees of heat and cold. They show a marked aversion to the action of mercuric chlorid, very weak solutions of which (1 : 10,000) will render them inert. The amount of semen deposited in sexual congress varies, but is on an average about 3.7 cubic centimeters (1 dram). When much in excess of this amount the condition is known as *polyspermism*, while if the quantity is markedly deficient it constitutes the pathologic condition of *oligospermism*.

The *orgasm* is the crisis of the venereal passion. Normally it should take place simultaneously in the male and the female, and when such coincidence occurs conception is more probable. This is, however, not absolutely essential to fecundation, for the orgasm may be entirely absent in the woman and impregnation follow. This has been noted in cases of sexual apathy, or when intercourse has been indulged in while the woman was intoxicated, unconscious, asleep, or under the narcotic influence of some drug. During the orgasm in the female there is said to be a slight descent of the uterus accompanied by a contraction of its muscular fibers, resulting in a suction-process in the cervix, the external os rapidly opening and closing, and thus affording ready entrance to the fertilizing fluid.

Fecundation.—The spermatozoa, being thus received within the uterine cavity, take up their journey to meet the ovum. The rate at which they travel upward in the uterus is, according to Henle's observations, about an inch in a little over seven minutes. This is accomplished by means

of the vibrations of the tail-like appendage. There is still considerable uncertainty as to just where impregnation takes place. The consensus of opinion, however, favors the tubes, or even the ovarian surface, as the meeting-place, and this view is substantiated by the fact that unless impregnated very shortly after its discharge from the Graafian follicle the ovum becomes incapable of fertilization. The *time* when impregnation is most prone to follow intercourse has been generally stated as being from the first to the tenth day after menstruation, the ovum being discharged immediately upon full establishment of the menstrual flow, and the vital elements, male and female, being brought into immediate proximity. The periods of comparative (but not absolute) immunity are the second week before the expected appearance of the flow, and the first four months of lactation; statistics show that insemination occurring during these periods is likely to be fruitless.

Method of Impregnation.—This question is now positively determined. There is beyond doubt an actual penetration by the spermatozoids of the vitelline membrane of the ovum (Fig. 21), and this penetration probably takes place through a minute opening, the *micropyle*. At least this is true of invertebrates, and probably of the rabbit, and, inferentially, the existence of such an entrance in all ova may be assumed. As to the cause of the mutual attraction of ovum and spermatozoid little is known. It is probable that but one spermatozoid finds entrance into the ovum, and that this accomplishes the work of fertilization. The ovum, being thus fecundated, proceeds on its

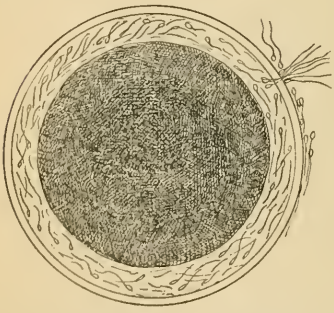


FIG. 21.—Ovum of the Nephelis vulgaris, showing retraction of vitellus and the penetration of the spermatozoa through the vitelline membrane; × 300.

way to the uterus, where it finds permanent lodgement at about the tenth to the twelfth day after impregnation. Its point of attachment is generally high up on the posterior uterine wall near the orifice of one of the Fallopian tubes.

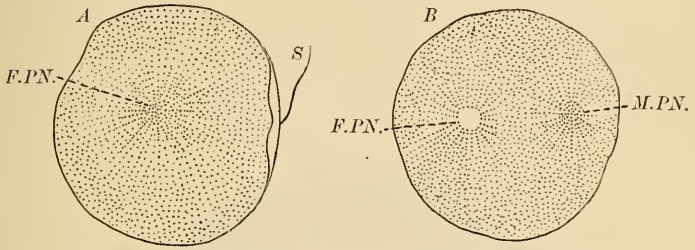


FIG. 22.—Fertilization of the ovum of a mollusk (Elysia viridis): *A*, ovum sending up a protuberance to meet the spermatozoön (*S*); *B*, approach of male pronucleus (*M. PN.*) to meet the female pronucleus (*F. PN.*).

Changes in the Ovum Prior to its Lodgement in the Uterus. — An interesting series of phenomena occur within the ovum immediately subsequent to impregnation. Shortly after penetration of the ovum the vibratile extremity of the spermatozoid is absorbed, leaving the head only, which is known as the *male pronucleus* (Fig. 22). This unites with the female pronucleus to form the ~~oösperm or blastosphere~~. The female pronucleus is formed in the following manner: Within a few hours after impregnation the protoplasmic yelk undergoes a process of shrinkage, so that a transparent space is seen to exist between it and the vitelline membrane. Simultaneously with this process there occurs a disappearance of the germinal vesicle and spot, and two protrusions of granular material,

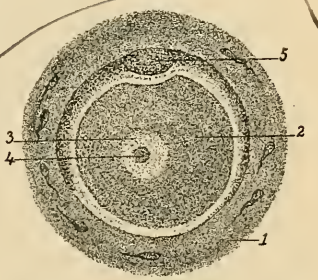


FIG. 23.—Formation of the "polar globule": 1, zona pellucida, containing spermatozoa; 2, yelk; 3, 4, germinal vesicle; 5, the polar globule.

the *polar globules* (Fig. 23), take place from the contracted yelk into the clear space beneath the vitelline membrane. A new nucleus now appears from the débris of the faded germinal vesicle, and to it has been given the name of the *female pronucleus.* In the center of the contracted yelk a clear vesicle appears, known as the *vitelline nucleus*, and this is regarded as the first sign of impregnation.

The changes in the oösperm or blastosphere consist primarily in a division of the vitelline nucleus, followed by

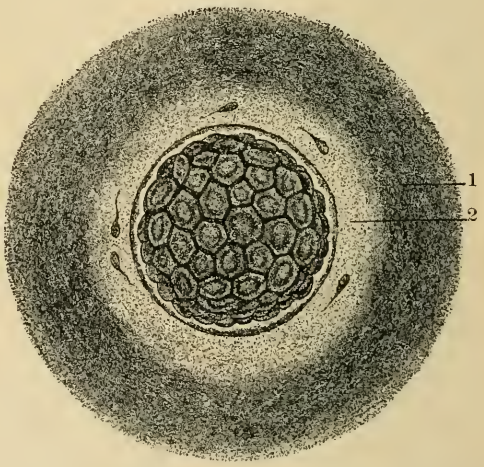


FIG. 24.—Formation of the blastodermic membrane from the cells of the muriform body: 1, layer of albuminous material surrounding 2, the zona pellucida (after Joulin).

segmentation of the vitellus. This process of division and subdivision proceeds rapidly until the *morula*, *muriform body*, or *mulberry mass*, as it is variously termed, is formed. Within the center of this morula there appears an accumulation of a transparent fluid, which by its pressure crowds the morula, in the form of a thin layer of cell-like structures, against the vitelline membrane. To this cellular layer has been assigned the name of the *blastoderm* or *blastodermic membrane* (Fig. 24), and from it are developed

the various fetal portions. The entire ovum at this stage is termed the *blastodermic vesicle*.

The blastoderm undergoes a rapid series of changes. Three layers may be distinguished, the outer of which is the *epiblast*, the middle the *mesoblast*, and the inner the *hypoblast*. Each of these layers has its special function in the development of the fetus. Thus from the *epiblast* are derived the dermis and its appendages, the organs of special sense, the central nervous system, and the amniotic membrane; from the *mesoblast* arise the osseous, muscular, vascular, and genito-urinary systems and the connective tissue of the body; and from the *hypoblast* are derived the epithelial lining of the alimentary and respiratory tracts, the umbilical vesicle, and a portion of the allantois.

An aggregation of the hypoblastic cells now occurs, resulting in the production of a small elevated spot known as the *germinal* or *embryonic area*. In the center of this area appears a dark line, which is the first indication of the coming fetus, and is termed the *primitive trace* or *groove* or the *embryonic line*. It is surrounded by a translucent space, the *area pellucida* (Fig. 25). About this time the *fetal ellipse* begins to make its appearance. It is formed by a rolling in of the two extremities of the primitive trace, resulting in the formation of two folds known as the *anterior*, *cephalic*, or *head fold* and the *posterior*, *caudal*, or *tail fold*. At the same time lateral folds develop on either side and in front of the primitive groove; these are termed the *medullary folds*, and they include between them a furrow known as the *medullary groove*. The caudal portion of the lateral

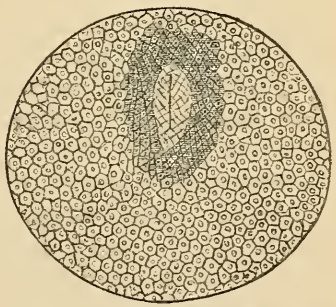


FIG. 25.—Diagram of the area germinativa, showing the primitive trace and the area pellucida.

folds springing from the sides of the primitive trace are named the *dorsal plates*, and they ultimately form the spinal canal; they include the *chorda dorsalis* or *notochord*, the primitive vertebral column. From their bases spring two other folds, the *lateral* or *abdominal plates*, which enclose the future abdominal cavity.

The Fetal Appendages and Membranes.—While these processes of development have been going on in the fecundated ovum corresponding changes have been in progress for the reception, nourishment, and development of the little embryo. The uterus has assumed an unwonted growth, and a receptacle has been provided to accommodate the fetus up to the full term of normal gestation, together with the proper means of best furnishing it nutriment during the different periods of its growth; thus the various membranes, fetal and maternal, and the organs of nutrition and respiration—the umbilical vesicle, the allantois, the umbilical cord, and the placenta—have been called into existence to meet the various indications.

The Membranes.—The membranes are three in number, the amnion, the chorion, and the decidua, the latter only being maternal in origin. As the decidua claims priority in formation, it will be considered first.

The Deciduæ.—The hypertrophied uterine mucosa forming the outermost or containing membrane of the product of conception is known as the *decidua* or *caduca*. *Origin.*—Immediately after conception there ensues an extreme vascularity of the lining membrane of the uterus, and this results in a very short space of time in an immense hypertrophy and proliferation of the connective-tissue cells lying between the utricular glands. In consequence of this exaggerated growth of embryonic cells—the so-called "*decidual cells*"—the uterine mucosa is thrown into very decided convolutions, that fill the entire uterine cavity and form a soft, pulpy investment for the impregnated ovum, which is completely buried in the meshes so produced (Fig. 26). The

deepest layer of this decidua is composed of interlacing fibers with blood-vessels and the blind extremities of the utricular glands. It is termed the *spongy* layer of the decidua, or the *postage-stamp layer* (Berry Hart). For convenience the decidua has been divided into three portions — the *decidua vera*, or that lining the entire uterine cavity; the *decidua reflexa*, or the portion that is reflected or thrown over the ovum; it eventually—during the fourth month—comes in contact with the decidua vera, with which it forms an intimate union, the two eventually becoming one membrane; until this union takes place the space between the two is filled with *hydroperione*, a mucous fluid somewhat resembling the liquor amnii. The *decidua serotina* is the area of the decidua vera occupied by the ovum, and which ultimately becomes the placental site.

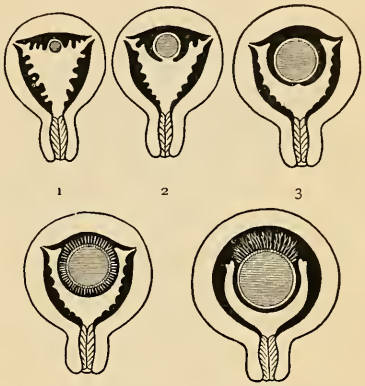


FIG. 26.—Diagrams representing the relationship of the decidua to the ovum at different periods. The deciduæ are colored black, and the ovum is shaded transversely. In 4 and 5 the vascular processes of the chorion are figured. 1, ovum entering the congested mucous membrane of the fundus—decidua serotina; 2, decidua reflexa growing around the ovum; 3, completion of the decidua around the ovum; 4, general growth of villi of the chorion; 5, special growth of villi at placental attachment, and atrophy of the rest (Dalton).

Ultimate Disposition.—During the latter months of pregnancy the decidua undergoes a fatty degeneration that tends to loosen its attachment to the uterus. The bulk of this degenerated membrane is thrown off at parturition; the balance is discharged in the lochia, with the exception of a small portion that assists in the formation of a new uterine mucosa.

The Amnion.—The amnion (Fig. 27) is a smooth, very tough, fibrous structure, the innermost of the fetal mem-

branes, surrounding the fetus and continuous with it at the umbilicus; it secretes and encloses the liquor amnii. It also contributes the sheath or outer covering of the umbilical cord. *Origin.*—This structure is a double membrane derived from the epiblast and mesoblast at an early period in fetal development. The enclosed space is the true *amniotic sac* or *cavity*, and in this is contained the liquor amnii. The space between the folds of the outer layer of the amnion—which is mesoblastic in origin, the inner being epiblastic—and the chorion is termed the *false amniotic cavity*. It contains the allantois, the umbilical vesicle, and, at times, a mucous fluid closely resembling the liquor amnii, the hydroperione, previously mentioned. At birth the amnion in conjunction with a portion of the chorion forms the so-called "bag of waters."

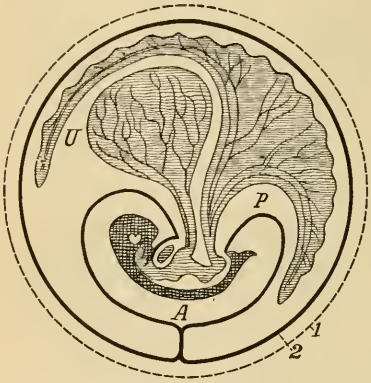


FIG. 27.—Diagram showing completion of the amnion and formation of the chorion: *A*, amnion; 1, zona pellucida; 2, outer lamina of the epiblast after closure of the amniotic folds; *P*, allantois; *U*, umbilical vesicle.

The Liquor Amnii or "Waters."—Within the cavity of the amnion is an alkaline fluid amounting at term to about a quart, and containing albumin, urea, creatin, epithelial cells, the chlorids, phosphates, and other salts, sebaceous material, and various other constituents, and having a light specific gravity—about 1005. Its color is usually an opaque white, although it may be variously colored by accidental ingredients, and its odor is heavy and characteristic. Its *origin* is a matter of dispute. It is probable that at first it is derived mainly from the amniotic cells, but that during the latter half of pregnancy this fluid is increased in amount by the accumulation in it of the fetal urine, which is voided at

Probably the liquor amnii comes in large part through the amnion, from the chorion and from the uterus.

irregular intervals. The *function* of the liquor amnii during pregnancy is mainly protective to both mother and child. By distending the uterus it prevents undue pressure of the uterine walls upon the fetus, thus admitting of unrestricted growth and free fetal movements, and thereby preventing the development of monstrosities; it also saves the uterus from injury due to the fetal movements; it maintains around the fetus an equable temperature, receives and dilutes its excretions, and, since it is a well-recognized fact that the fetus will at times swallow the amniotic fluid, by some it is supposed, probably without foundation, to afford a certain amount of nourishment to the child. During labor a very valuable function is its hydraulic action. Driven downward by the uterine contractions, it dilates as a wedge the circular fibers of the os uteri, and also lubricates the tissues to a limited extent.

The Umbilical Vesicle and the Allantois.—Within the false amniotic cavity are found two important nutritive structures of the fetus—namely, the umbilical vesicle and the allantois—which must now be described.

The *umbilical vesicle* is a temporary spheroid structure formed from the hypoblast by the union of a caudal and a cephalic projection from the embryo. As these two projections approach one another on the anterior surface of the embryo they divide the protoplasmic yelk into a larger and a smaller portion; the latter becomes eventually the intestinal canal of the fetus, while the larger is termed the *umbilical vesicle*, *vitelline sac*, or *navel sac*. The constricted portion joining the intestine and the umbilical vesicle is termed the *vitelline*, *vitellointestinal*, or *omphalic duct*, and it is through this duct that nutriment is carried from the umbilical vesicle to the intestinal tract of the embryo prior to the formation of the placenta. After the fourth week of gestation the umbilical vesicle undergoes an atrophic process, and by the eighth week it has disappeared, its function then being assumed by the placenta.

The *allantois* is a small, pear-shaped vesicular structure developing from the lower portion of the embryonic alimentary canal at an early period of intrauterine life—about the twentieth day. It is composed of two layers, derived respectively from the mesoblast and the hypoblast. The mesoblastic layer is the vascular element of the allantois, and in it are soon formed four vessels—two arteries and two veins. A smaller portion of the intestinal diverticulum from which the allantois is developed enters into the construction of the urinary bladder. Owing to its rapid growth, the allantois in the third week is brought into contact with the inner surface of the chorion, with which it forms intimate connections. From its pedicle are developed ultimately the umbilical cord and the *urachus*, or *allantoic stalk*, the latter in the adult being a remnant of fetal life acting as one of the ligaments of the bladder. The point of entrance of the allantoic vessels into the chorion becomes eventually the placental site. The *function* of the allantois is, primarily, to remove the excrementitious matter of the fetus, and secondarily and more important, to carry the nutritive vessels, the umbilical arteries and veins, from the fetal intestine to the chorion.

The Chorion.—The chorion is the external fetal membrane lying between the amnion and the decidua. It is the vascular organ of the embryo, and is epiblastic in origin. Its characteristic anatomic feature is the development over its outer surface of a great number of minute and branching projections known as the *chorionic villi*, which give a peculiar shaggy appearance to this side of the membrane; these villi in the second or third month are received into corresponding depressions in the decidua, and serve in the early weeks of pregnancy as a means of attachment for the ovum, retaining it in position in the upper portion of the uterus. Each villus is hollow and contains, within a short time after its development, an arterial and a venous loop; it is lined within by a delicate epithelium called the

endochorion, and without by another, the *exochorion* (Fig. 28). The inner surface of the chorion is smooth and glossy. The primitive chorion is reinforced in the third week by the union with the allantois, and the resulting structure is designated as the *true* or *complete chorion*.

During the second month of gestation a curious change takes place in the outer surface of the chorion. The villi covering that portion attached to the decidua reflexa lose their vascularity and undergo an atrophic process, while those covering the portion of the chorion over the decidua serotina assume a correspondingly rapid increase in size and vascularity. As a consequence, the chorion by the beginning of the ninth week becomes divided into two portions—namely, a larger smooth portion, the *chorion lævе*, comprising about two-thirds of its surface, the function of which is to surround and protect the embryo, and a smaller, shaggy or villous portion, the *chorion frondosum*, which develops into the fetal portion of that important nutritive organ, the placenta.

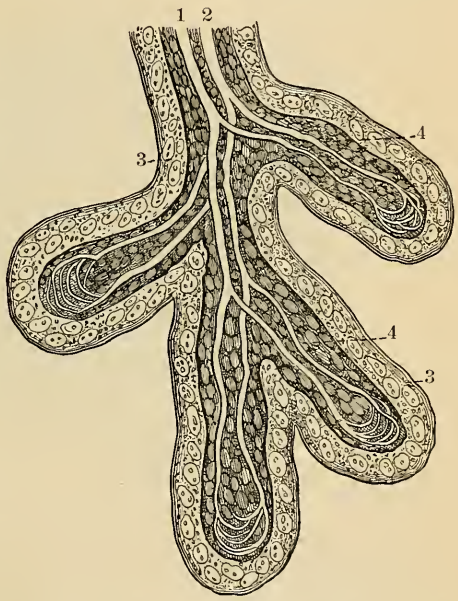


FIG. 28.—Placental villus, greatly magnified: 1, 2, placental vessels, forming terminal loops; 3, chorion tissue, forming external walls of villus; 4, tissue surrounding vessels (after Joulin).

THE PLACENTA, OR AFTER-BIRTH.—The placenta (Figs. 29, 30) is the essential nutritive and respiratory organ of

the fetus. *Formation.*—During the rapid development of the chorion frondosum a corresponding change takes place in the decidua serotina; its tissues hypertrophy and become thick, spongy, and very vascular. The chorionic villi sink deeply into this pulpy mass and become intimately con-

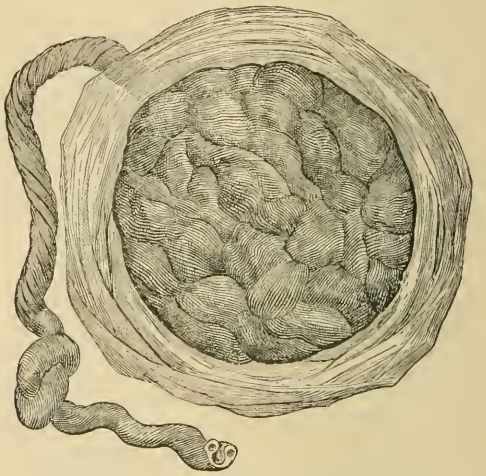


FIG. 29.—Human placenta, uterine surface (Tarnier).

nected with it, so that separation can only be accomplished by actual tearing of the decidual substance. By the end of the third month the placenta is fully formed and is able to assume the functions for which it is destined. These *functions* are the supplying of nourishment from the mother to the fetus, the oxygenation of the impure fetal blood, and the excretion of the effete products from the fetus. It is probable that the placenta also possesses to a certain extent a glycogenic function. Any disturbance of these functions will result in disease or death of the fetus. *The Placenta at Term.*—When fully developed the placenta is a flat, circular, spongy structure from 15 to 23 cm. (5.9055 to 9.0551 in.) in diameter, 1¼ to 2½ cm. (0.492125 to 0.98425 in.) thick at the central point, and weighing usually slightly over a

pound. It presents two surfaces—a smooth *internal* or *fetal surface*, clothed with the fetal membranes, and to the center of which is generally attached the umbilical cord; and a dark-red, granular, lobulated *external* or *maternal surface*, by which it is attached to the decidua. Its usual

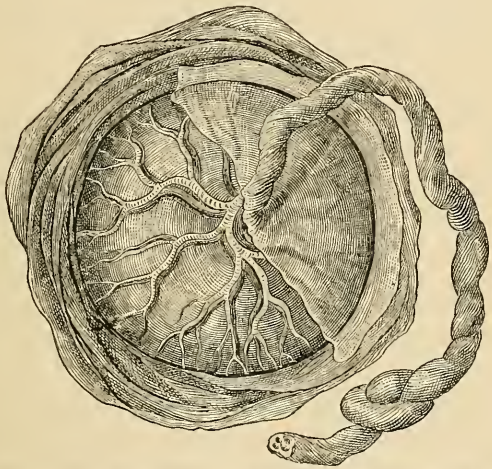


FIG. 30.—Human placenta, fetal surface. The amnion is dissected off one side to show the vessels (Tarnier).

point of attachment is the upper posterior uterine wall near one or the other tubal orifice, and it generally faces the ventral surface of the fetus. It is possible, however, for it to be attached to any portion of the surface of the uterine cavity. In structure it is both fetal and maternal, though mainly the former; it is composed of from fifteen to twenty tufts of chorionic villi, together with the immensely hypertrophied connective tissue of the uterine mucosa (*decidua serotina*). *Ultimate Disposal.*—Shortly before the termination of pregnancy a partial fatty degeneration occurs in the maternal portion of the placenta; in this way the separation of the organ at parturition is facilitated. Should this process be carried too far, fetal death may result from asphyxiation,

either from premature separation of the placenta or from interference with the placental respiratory function.

The Umbilical Cord, or Funis.—This is a cord-like structure, also called the *navel-string* or *funicle*, extending from the umbilicus of the fetus to the placenta. The line of demarcation separating the cord from the skin is termed the *navel ring*. *Origin.*—The funis is developed from the pedicle of the allantois at about the fourth week of pregnancy. When fully formed it is composed of two umbilical arteries, which are provided with circular valves having central perforations, one umbilical vein having semicircular valves, the vitelline duct, the pedicle of the allantois (at the fetal extremity of the cord), the remains of the umbilical vesicle (at the distal extremity), the whole being surrounded by a varying amount of transparent gelatinous substance known as *Wharton's jelly* or *gelatin* (which protects the important funic structures from injurious pressure), and an outer sheath or covering of amnion. In length the cord normally measures about 50 cm. (19.6850 in.); it is from ¾ to 1¼ cm. (0.295275 to 0.492125 in.) in thickness. The vessels are coiled from right to left, the arteries being external and surrounding the veins; hence their pulsation—the *funic pulse*—can readily be detected. There are generally about ten or twelve of such twists. Frequently distinct knots are found in the cord, which, however, do not as a rule interfere with the vitality of the child. The placental implantation of the cord, while most frequently median, may be marginal, when the interesting condition known as *battledore placenta* (Fig. 31) results. *Function of the Cord.*—The funis is the medium of communication be-

FIG. 31.—Battledore placenta, oval (Auvard).

tween the mother and the fetus, conveying nourishment from the mother to the child and excrementitious matter from the fetus to the placenta. Its function is, therefore, duplex.

IV. THE PHYSIOLOGY OF PREGNANCY.

I. Fetal Physiology.

During the rapid development of the embryo its vital functions have been assumed one by one, until it practically carries on an existence very similar to that of the individual *ex utero*, but with notable modifications dependent upon its peculiar environment.

Fetal Nutrition.—Pre-eminent among these changes are to be noted the various methods by which the requisite nourishment is obtained during the successive stages of gestation. It is impossible in a manual of the present dimensions to dwell largely upon the interesting changes observed in fetal alimentation and assimilation. A mere outline must be sufficient to portray the successive stages in fetal nourishment from the ovum to the fully-developed product of conception. This subject may be studied at four different periods—namely, the tubal, the vitelline, the allantoic, and the placental.

Tubal Nutrition.—The method by which the fecundated ovum obtains its nourishment during the short period of migration through the Fallopian tube into the uterine cavity is still a matter of conjecture. There can be no doubt that the nutritive material is introduced into the ovular substance by a process of endosmosis, but as to the source of this pabulum nothing positive is known. In the first few days of fecundation it is probable that the cells of the discus proligerus themselves nourish the ovum, and that the material thus furnished is supplemented by an absorption of the albuminous matter that coats the ovum

while in the tube. Whether or not there is an actual secretion of a nutritive liquid by the mucosa of the Fallopian tube, as has been claimed by some, is not known.

Vitelline Nutrition.—From the time of entrance into the uterine cavity until the formation of the allantois the growing embryo absorbs its nutrition from the umbilical vesicle through the agency of the omphalo-mesenteric vessels. The omphalo-mesenteric artery is a direct branch of the primitive aorta, and as such carries to the developing ovum the richest of pabulum. This vessel subsequently becomes the umbilical artery. The vitelline stage of nutrition covers the period up to the beginning of the fourth week of gestation, by which time the allantois is formed and has assumed the nutritive function.

Allantoic Nutrition.—The period of allantoic nutrition covers the space of two months, or until the formation of the placenta at the end of the third month. The allantois, being intimately connected with the chorion, receives the nutritious substance absorbed by the chorionic villi from the maternal tissues and transmits this through its vessels to the fetal intestine. This is the beginning of nourishment through the agency of a vascular system. As the placenta is formed the allantois relinquishes to this organ its function, loses one of its veins, and gradually assumes the secondary rôle of the means of communication between the active absorbing agent and the fetus; in other words, it develops into the umbilical cord.

Placental Nutrition.—Contrary to that which might be expected, the closing stage in fetal nutrition is not well understood. The most generally accepted hypothesis is that which assumes the existence of a system of sinuses in the maternal placenta, accommodating corresponding chorionic digitations. The terminal capillaries of the umbilical vessels form loop-like projections which are continued in the chorionic villi, one in each ramification of a villus. The maternal portion of the placenta is composed of a mesh-

work of decidual tissue enclosing a vast number of spaces or lacunæ that communicate directly with the terminal branches of the uterine arteries, and are therefore, in reality, immensely dilated capillaries. Into each lacuna one of the chorionic villi dips and is continually bathed in the slowly-flowing maternal fluid. There is thus no direct communication between the fetal and maternal circulations, the interchange of nutritious and excrementitious matter being accomplished altogether by an osmotic process.

According to some authorities (Ercolani, Haller), each villus is lined by a peculiar glandular structure of maternal origin whose function it is to elaborate from the maternal blood a highly nutritious, albuminous, saline, and fatty substance called *uterine milk;* this, these writers claim, is absorbed by the capillaries of the villi and enters the fetal circulation. This view has not been substantiated by more recent investigators, notably Werth. It is probable, therefore, that the preceding view of direct osmotic interchange is the correct one.

Fetal Respiration.—The respiratory function of the fetus is established when the fully-formed placenta assumes the work previously carried on by the allantois. The method by which the oxygenation of the blood is accomplished prior to this time remains undetermined. Respiration in the fetus after the formation of the placenta is piscine in nature, the gaseous interchange being accomplished through the medium of a fluid, the maternal blood. The fetal blood, contaminated by an absorption of carbonic-acid gas during its passage through the fetal structures, finally reaches the chorion, where it is exposed, over the widely-extended surface afforded by the chorionic villi, to the revivifying action of the maternal blood. The carbonic dioxid is abstracted, its place is supplied by fresh oxygen from the maternal blood, and the bright-red blood thus produced, enriched by the further absorption of the nutritious pabulum, re-enters the fetal circulation.

Fetal Circulation (Fig. 32).—In order that the pabulum and oxygen supplied at the placental site shall gain

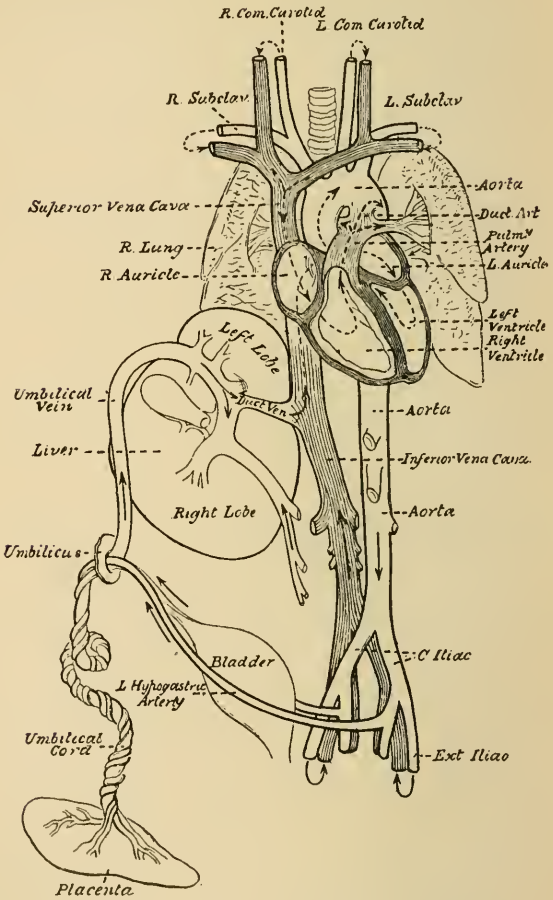


FIG. 32.—Diagrammatic view of the fetal circulation.

access to the various fetal tissues, it becomes necessary that they be distributed throughout the body through the agency of the vascular system. Owing to the non-activity of the

respiratory and digestive systems there is evolved a complex method of circulation, varying very radically from that which takes place in the individual *ex utero*. The center from which the blood is derived, and to which it is impelled by the action of the fetal heart, is the placenta; here it is that the impure venous blood is depleted and the rich red arterial blood is elaborated, and hence it is here that a systematic study of the fetal circulation should begin.

Surcharged with its vital constituents, the blood collects from the venous radicles in the chorionic villi and finds its way into the large umbilical vein. This passes down the umbilical cord to the navel, and thence is carried to the under surface of the liver. Here it divides into a large and a small branch, the latter of which, the *ductus venosus* or *duct of Arantius*, situated posteriorly, passes directly across to the ascending vena cava. The greater portion of the blood, however, empties into the portal vein and is carried into the right hepatic lobe. Passing through the liver, in the substance of which it probably undergoes some metabolic changes, the blood re-collects in the hepatic vein, through which it passes to the ascending vena cava. Here it joins the blood that pours in from the ductus venosus, together with the vitiated blood coming up in the ascending cava from the inferior extremities, and the mixed current thus formed ascends to the right auricle of the heart.

The *fetal heart* differs very materially from that of the adult individual. In the first place, there is a free communication between the right and left hearts by means of the *foramen ovale*. This is a small oval aperture in the interauricular septum, provided with a valve or duplicature of the endocardium that opens into the left auricle and permits a flow of blood only from the right side to the left. The opening of the inferior vena cava into the right auricle is guarded by a duplicature of the lining membrane of that sac, known as the *Eustachian valve*, a semilunar structure situated in the lower and posterior portion of the

auricle, between the anterior margin of the inferior vena cava and the auriculo-ventricular orifice. It directs the current from the ascending cava across the right auricle and through the foramen ovale into the left auricle.

To prevent an undue congestion of the lungs, which are functionally in abeyance, a large communicating vessel is provided, running from the point of bifurcation of the pulmonary artery to the descending portion of the arch of the aorta. This vessel is known as the *ductus arteriosus* or *duct of Botal* (or *Botallo*); its function is to convey a large portion of the blood, which otherwise would dangerously engorge the pulmonary tissues, directly into the aorta. With this knowledge of the peculiarities of the anatomy of the fetal heart a clear understanding of the course of the fetal circulation may be obtained.

Having found its way through the hepatic tissue into the ascending cava, the blood is carried upward to the floor of the right auricle, where it is directed by the Eustachian valve across the cavity of the auricle through the foramen ovale into the left auricle. It then passes through the left auriculo-ventricular orifice into the left ventricle, which, by its contraction, drives it out into the aorta. The large vessels to the head and upper extremities being given off by the aorta shortly after its emergence from the heart, most of the blood-current is carried upward through these large branches, only a small portion passing on to enter the descending aorta.

The blood supplied to the upper portion of the fetal body finds its way eventually through the venous radicles into the descending vena cava. Originally this vessel is known as the *right duct of Cuvier*, formed by the union of a superior vein (the primitive jugular) and an inferior vein. The left duct disappears during the process of development. This cava communicates with the upper portion of the right auricle, and its current, passing down in front of the current of the ascending cava, enters the right ventricle through the

right auriculoventricular orifice. Here it is driven out into the pulmonary artery, and the greater volume of it passes directly into the descending aorta through the ductus arteriosus; enough enters the pulmonary tissue to supply thereto the necessary nutriment. The vitiated blood in the aorta is now carried down to the division of that large trunk into the two iliac arteries, and thence through the hypogastric arteries (branches of the internal iliac artery), which ultimately become the umbilical arteries; the latter continue up the cord to the placenta, thus completing the cycle of the fetal circulation.

The fetal circulation, as depicted in the foregoing paragraphs, is modified somewhat toward the close of the period of gestation by the partial atrophy of the Eustachian valve which occurs at that time. By its loss of substance a partial mingling of placental and vitiated blood is permitted in the right auricle of the heart, and this mixed blood is carried down into the right ventricle, and thence through the ductus arteriosus and aorta to the lower portions of the body, which thus receive a higher grade of nutrition than in the earlier months. This accounts for the more rapid development of the lower extremities immediately prior to the onset of labor.

Fetal Secretions and Excretions.—As pregnancy advances and the metabolic changes in its organism become more marked the emunctory organs of the fetus begin to manifest their activity. The following changes may be noted:

(1) *The Kidneys.*—These organs begin to form at about the seventh week, and communicate at first by means of their ducts with the cavity of the allantois, but as the bladder is developed from this structure the ureters make their exit eventually into the latter viscus. Sooner or later urine is excreted to a limited extent, and is voided in small quantities at irregular intervals into the amniotic sac, as is demonstrated by the presence of traces of urea in the liquor amnii. There is also an escape of urine from the

bladder immediately after birth, thus proving the activity of the fetal kidneys. Fetal urine always contains more or less albumin. An interesting point of medico-legal value is the formation of dark-yellow infarcts of urates within the kidneys of infants that have breathed, even though it be but slightly, before death. The cause of these infarcts is not known.

(2) *The Skin.*—It is not until the latter part of the fifth month that the skin commences to show glandular activity. At that time the sebaceous glands throw out a greasy, unctuous substance, which when mixed with desquamated epithelial cells constitutes the so-called *vernix caseosa* or "*cheesy varnish.*" This is more abundant upon some fetuses than upon others, and is most marked upon the back and in the axillæ, groins, and other cutaneous folds. Its *function* is to prevent maceration of the fetus by the action of the liquor amnii, and probably also it acts, to a certain extent, as a lubricant during parturition.

(3) *The Bowels.*—These are inactive throughout intra-uterine life; during the latter half of pregnancy they contain the meconium, which, however, is not discharged except in pathologic conditions. The *meconium* is a dark-green, viscid liquid composed of intestinal mucus, bile, lanugo, and exfoliated epithelium from the mucosa of the bowel.

(4) *The Liver.*—This organ does not functionate until about the fifth month of gestation. From that time on it secretes the bile which is stored up in the intestines and gall-bladder. As to its other functions there is nothing positively known. Bernard has attributed to it the production of the glycogen that is present in large quantities in the fetal tissues, but this has not been absolutely demonstrated. It is probable from the disproportionate size of the fetal liver that it has assigned to it some important action or function that is as yet unrecognized.

Fetal Innervation.—The question as to whether or not the fetus is capable of intelligent or voluntary nervous action

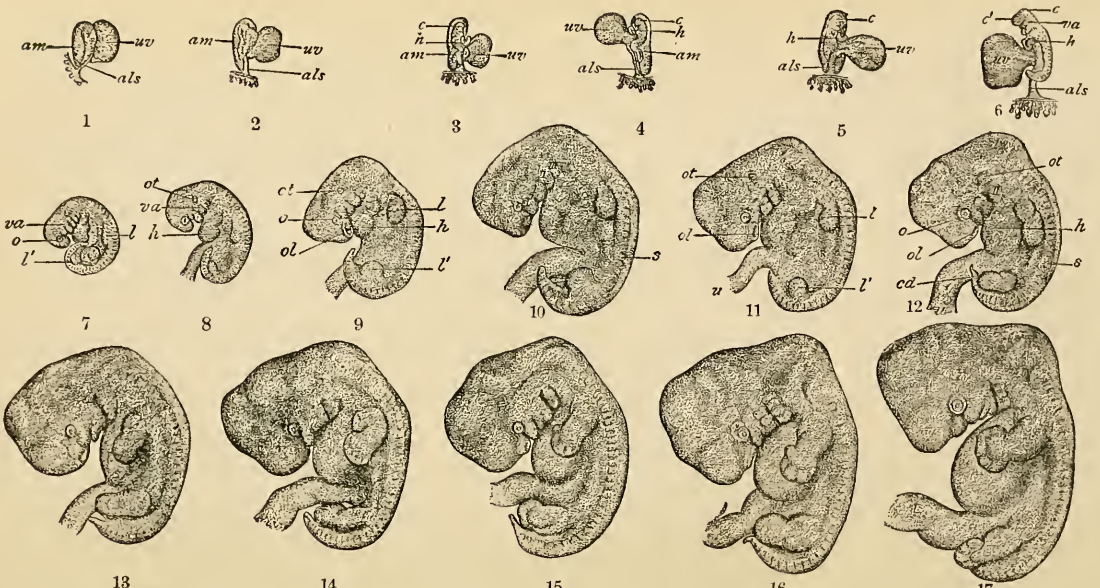


FIG. 33.—Early human embryos, all enlarged about two and a half times: 1–4, from twelfth to fifteenth day; 5, 6, from eighteenth to twenty-first day; 7, 8, from twenty-third to twenty-fifth day; 9–12, from twenty-seventh to thirtieth day; 13–17, from thirty-first to thirty-fourth day. *am*, amnion; *uv*, umbilical or vitelline vesicle; *als*, allantoic or abdominal stalk; *c*, *c'*, brain-vesicles; *h*, heart; *va*, visceral arches; *o*, optic vesicle; *ot*, otic vesicle; *ol*, olfactory pit; *l*, *l'*, upper and lower extremities; *s*, somites; *cd*, caudal process; *u*, primitive umbilical cord (His).

is still *sub judice;* it is probable, however, that such volition does not exist, but that the fetus can respond only to reflex impulses originating in some form of irritation, such as the action of cold or of an external force.

Fetal Development at the Successive Months of Gestation, with Correlated Clinical Manifestations and Pathologic Conditions (Fig. 33).—*From the Tenth to the Twelfth Day* (the time of entrance into the uterine cavity). In this period the embryo exists merely as the disk-like embryonic spot. The dorsal or abdominal plates may be seen. Size of the ovum, ⅔ cm. (0.26246 in.); of the embryo, ¼ cm. (0.098425 in.).

First Month.—The amnion and umbilical vesicle are fully formed; the allantois is present, but is not united with the chorion; the visceral arches are distinct; the spinal canal is closed. The fetal organs that may be distinguished are the heart, primitive traces of the liver and kidneys, the eyes, and the intestine with anal and oral orifices; the extremities are rudimentary. The length of the fetus is 1 cm. (.3937 in.). *Clinical Manifestations.*—Suppression of menstruation; enlargement and bogginess of the uterus; softness of the cervix; enlargement and tingling of the breasts; frequent micturition. *Malformations and Diseases.*—Spina bifida (from failure of the spinal canal to close); abortion.

Second Month.—The embryo is the size of a pigeon's egg. The amnion is distended with fluid and is in contact with the chorion. The umbilical vesicle is small; the umbilical cord is distinct. The visceral clefts, with the exception of the first, are closed; the eyes, nose, and ears are distinguishable; there are primitive traces of the hands and feet, which are webbed; the vertebræ are present; there is beginning formation of the external genitals, although sex is not to be differentiated; there is a beginning of the ossification of the lower jaw and clavicle; the circulatory system is forming; the Wolffian bodies are present; the kidneys and suprarenal capsules are forming. The length of the

fetus is 4 cm. (1.5748 in.); its weight is 4 grams (61.729 grains). *Clinical Manifestations.*—The same as the preceding; in addition, there are nausea and vomiting (from the sixth or seventh week) and Rasch's sign. *Malformations and Diseases.*—Arrest of development results in hare-lip, umbilical hernia, exomphalos. The maternal pathology includes abortion, apoplexy of the decidua, uterine prolapse, herpes gestationis, rupture of an extrauterine pregnancy, hemorrhage from placenta prævia (central variety).

Third Month.—The embryo has attained the size of a goose-egg; there is now nourishment by means of maternal blood; the chorionic villi are lost; the placenta is formed, but is small; the decidua reflexa and decidua vera come in contact; the digits become distinct (they are not webbed and show membranous nails); the neck is distinguishable; the ribs are formed; the uterus appears, thus distinguishing the sex; the integument is forming; points of ossification are present in most of the bones. The length of the fetus is 9 cm. (3.5433 in.); its weight is 30 grams (463 grains). *Clinical Manifestations.*—The same as the preceding; in addition, Hegar's sign is present; the fundus of the uterus is just above the pubes. *Diseases.*—Rupture of an extrauterine pregnancy may occur; apoplexy of the decidua; hydramnios; cystic degeneration of the chorionic villi; odontalgia (which may occur at any time during the first half of pregnancy).

Fourth Month.—There is a formation of Wharton's jelly in the cord; the latter is two or three times the length of the fetal body; there is the formation of hair upon the scalp, and of lanugo upon the body; there is a development of the convolutions of the brain and a formation of the muscles; the intestines contain meconium; the sex is well defined; ossification begins in the frontal and occipital bones. The length of the fetus is 16 cm. (6.2992 in.); its weight is 55 grams (848.76 grains). *Clinical Manifestations.*—The same as the preceding. In addition may be

noted Braxton Hicks' sign; quickening (four and one-half months); ballottement; Jacquemin's sign; uterine souffle; beginning abdominal enlargement; the fundus of the uterus is midway between the umbilicus and the symphysis. *Diseases.*—Miscarriage; hydramnios; cystic degeneration of the chorionic villi; incarceration of a retroflexed uterus; true nephritis is apt to manifest itself.

Fifth Month.—The hair and nails are fully formed; the vernix caseosa appears; the face is wrinkled and senile; the eyelids begin to open; ossification commences in the ischium. The length of the fetus is 25 cm. (9.8425 in.); its weight is 273 grams (10.8 ounces). *Clinical Manifestations.*—The same as the preceding. In addition, the fetal heart-sounds may be heard. *Diseases.*—Miscarriage; nephritis.

Sixth Month.—There is a beginning deposition of fat in the subcutaneous cellular tissue; there is increased growth of hair, and the appearance of eyebrows and eyelashes; the membrana pupillaris is present; the testicles commence to descend toward the inguinal rings; there is beginning ossification of the pubic bones. The length of the fetus is 30 cm. (11.8110 in.); its weight is 715 grams (23 ounces). *Clinical Manifestations.*—The same as the preceding. In addition, the umbilicus is on a level with the abdominal wall; the fundus of the uterus is on a level with the umbilicus. *Diseases.*—Kidney of pregnancy (albuminuria); hydrorrhœa gravidarum; impetigo herpetiformis, occurring at any time during the second half of pregnancy.

Seventh Month.—The skin is still wrinkled and reddish, and is covered with vernix caseosa; the eyelids are open; the membrana pupillaris disappears; the testicles are at or in the inguinal canal. The decidua reflexa and decidua vera have now thoroughly merged into one. The length of the fetus is 35 cm. (13.7795 in.); its weight is 1213 grams (39 ounces). *Clinical Manifestations.*—The same as the preceding. In addition, the outlines of the fetal body may be

felt on abdominal palpation, and the presenting part may be distinguished on vaginal examination; the fundus of the uterus is midway between the umbilicus and the ensiform cartilage. *Diseases.*—Hydrorrhœa gravidarum; recurrent vomiting of pregnancy from renal insufficiency.

Eighth Month.—The lanugo begins to disappear from the face; the nails are harder, but do not project beyond the finger-tips; the left testicle is in the scrotum; ossification begins in the lower epiphysis of the femur. The length of the fetus is 40 cm. (15.7480 in.); its weight is 1617 grams (4⅓ pounds). *Clinical Manifestations.*—The same as the preceding; the fundus of the uterus is now at the ensiform cartilage. *Diseases.*—The same as the preceding.

Ninth Month.—There is a great increase in the amount of subcutaneous fat; the face loses its wrinkled and senile appearance; the lanugo begins to disappear from the body; both testicles are in the scrotum; all the diameters of the fetal head are about 1 cm. (0.3937 in.) smaller than at term. The length of the fetus is 45 cm. (17.7165 in.); its weight is 1990 grams (5⅓ pounds). *Clinical Manifestations.*—The same as the preceding; the fundus of the uterus has fallen to about the same point that it occupied at the seventh month. *Diseases.*—Hydrorrhœa gravidarum and any of the diseases of the preceding months.

The Fetus at Term.—The body of the fetus at full maturity is well rounded; the lanugo has disappeared; the skin is rosy; the nails project beyond the finger-tips; the eyes are open; the cuboid bone is beginning to ossify. The length of the foot is 8 cm. (3.1496 in.); this is regarded by many as an important proof of fetal maturity. The length of the fetus is 50 cm. (19.6850 in.); its weight is 2737 grams (7⅓ pounds).

Delabout's Rule.—Delabout has formulated a rule for ascertaining approximately the age of a fetus by its length. It is worded as follows: "For the first six months of intra-

uterine life the length, at different ages, is indicated in centimeters by the square of the numerical figure of the corresponding month."

II. Maternal Physiology.

As a result of the foregoing remarkable and rapid changes occurring within the woman's uterine cavity corresponding alterations are taking place in the maternal organs and tissues. These changes, as might be expected, are most pronounced in the generative organs, and especially in the uterus.

Alterations in the Genitalia.—*The Uterus* (Figs. 34, 35).—Following the increased vascularity of the uterus there is a general hypertrophy of all the uterine tissues.

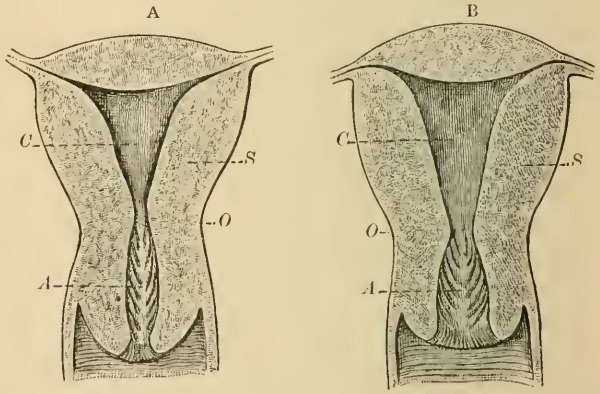


FIG. 34.—Longitudinal section of a nulliparous (A) and of a multiparous (B) uterus: *A*, cavity of the cervix and arbor vitæ; *C*, cavity of the body; *O*, constriction between body and cervix, the os uteri internum; *S*, wall of body (Tarnier).

The individual muscular fibers progressively increase in length, breadth, and thickness, so that the organ at term is about 12 inches long, 9 inches broad, and 8 inches thick, weighs about 2 pounds, and has a capacity of about 400 cubic inches. This increase in size is at first most marked in the anteroposterior and transverse diameters, the form

of the organ becoming spheric or ovoid, and an increase in the size of the uterus in these directions is very suggestive of the existence of gestation. It has been said that each fiber is increased from seven to eleven times in length and from three to five times in breadth (Kölliker). Naturally, such an excessive overgrowth renders the construction of the organ more patent, and a histologic examination of the pregnant uterus at term will reveal three distinct layers of the muscular substance. The *middle* layer is the densest, and its fibers have an oblique direction from above downward and from without inward. It is the most active portion in the process of parturition. The fibers of the *external* layer run horizontally, and are especially active in and around the cervical region. The *internal* layer is but poorly developed, and is largely sphincteric in function, its fibers being mainly grouped around the orificial regions (the tubes and the os internum).

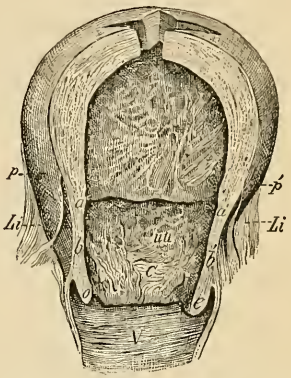


FIG. 35.—Uterus of a primipara who died twelve hours after labor at term: *uu*, lower uterine segment; *a*, *a'*, seat of os internum in Braune's drawing; *b*, *b'*, seat of Müller's os internum; *a b*, *b' a'*, lower uterine segment; *o*, *e*, os externum; *C*, cervical mucous membrane; *Li*, ligaments; *p*, *p'*, borders of peritoneum. The cervix from *o* to *b* is seen cleft (after Bandl).

Not only does the muscular substance undergo this hypertrophy, however, but all the constituent elements of the uterus participate. The delicate connective-tissue substance becomes edematous, softened, hypertrophied, and hyperplastic. The blood-vessels are increased in number, size, length, and tortuosity; an interesting point in reference to the veins is the disappearance of both the middle and external coats, leaving only the non-resisting intima which is in close contact with the muscular tissue of

the uterus. This provision of nature is a precautionary measure against postpartum hemorrhage, for as the uterus contracts the non-resisting venous channels are entirely obliterated and bleeding is prevented. The sexual apparatus is almost or altogether independent of the central nervous system for its innervation; hence is possible that curious phenomenon that has occasionally been observed—namely, parturition occurring in a paralyzed patient, the uterus responding to impulses that may be said to be purely sympathetic in origin. It is probable that the uterine plexus of sympathetic nerves is the center of the nerve-supply of the pelvic viscera; it gives off the two hypogastric plexuses, and from these filaments pass to the ovaries and tubes. The uterine nerves also partake in the general hypertrophy, and the uterus thereby becomes extremely responsive to impressions transmitted through the sympathetic system. In some neurotic individuals this sensitiveness becomes so extreme as to constitute the so-called "irritable uterus." The corresponding growth in the lymph-system of the uterus is significant in a pathologic sense as favoring the development of infective processes in the pelvis after labor. The lymph-spaces are immensely dilated, and, traversing the uterine tissues in all directions and having ready communication with the lymphatic structure of the peritoneum, it may readily be seen with what facility a general septic process may be instituted.

The *position* of the uterus varies in the different stages of pregnancy. Immediately following impregnation its increased weight produces an exaggeration of the normal anteflexion together with a partial descent of the organ. This primary fall is followed by a progressive rise until shortly before labor, when there is a secondary descent consequent upon the beginning of the mechanism of labor. The uterus is also slightly rotated on its axis from left to right by the position of the lower portion of the intestine; this is the so-called *lateral obliquity of the uterus.*

Cervix.—The only change to be noted here is an increased vascularity, with edema and softening of its tissues. The cervical glands are functionally very active, and their secretion, accumulating in the canal, produces the *mucous plug* that occludes the passage-way until the onset of labor. With the irritation produced by the incipient labor-pains the cervix shortens, and the internal os and subjacent canal, which thus far have remained closed in the vast majority of cases, begin to dilate.

Vagina and Vulva.—The hypertrophic process with the antecedent hypervascularity is quite pronounced here. The muscular and mucous coats are thickened and lengthened, and the latter becomes intensely engorged and darkened in color; the mucous glands secrete abundantly, and the attachment of the mucosa to the subjacent structures becomes somewhat loosened, so that it may be easily displaced or even torn off during labor; in this way vaginal prolapse is produced. The rugæ are well marked. The *vulva* is swollen, its orifice is patulous, and its glandular elements are active; the mucosa has a bluish tint.

Abdominal Walls.—At first flattened somewhat by the descent of the heavy uterus, the abdominal walls soon become prominent from the deposition within their substance of adipose tissue in large amount, as well as from the gradual distention produced by the growing uterus. As pregnancy advances the umbilicus approaches the level of the surrounding surface, which it reaches at the sixth month, and beyond which it protrudes during the latter months of gestation. As a result of the excessive distention the recti muscles become separated to a greater or less extent, and ventral hernia of the pregnant uterus may follow. Streaks or striæ of a livid, reddish, or bluish tinge appear in the flanks, resulting from laceration and atrophy of the subcutaneous tissues. These striæ persist after gestation as white cicatrices termed the *lineæ albicantes;* they are not diagnostic of pregnancy, but may be produced by any excessive

abdominal distention, as from advanced ascites or a large ovarian cystoma or uterine fibroid. They may also appear upon the buttocks and the outer surfaces of the thighs. The costal insertions of the abdominal muscles may be strained, and painful sensations may thus be produced as a result of pregnancy.

Pelvic Articulations.—The soft structures of the joints of the pelvis, the synovial membrane, and the cartilaginous caps of the bones partake in the general edema, and a slight amount of motion may, therefore, be observed in pregnancy. During labor this motion becomes much exaggerated.

Pelvic Contents.—The uterine appendages are drawn upward by the growth of that organ and become engorged in connection with the general pelvic congestion; consequently pressure-symptoms are prominent. Constipation and hemorrhoids are the rule, and the latter may involve the bladder as well as the rectum. Pressure upon the sacral plexus of nerves results in the familiar cramps in the limbs and the numb sensations of which so many patients complain. If the pelvic veins are encroached upon, varicosities of the limbs and genitalia and edema of these parts may occur. Pressure upon the bladder gives rise to frequency of micturition, a prominent symptom of early pregnancy.

General Alterations.—(1) *Vascular System.*—The amount of circulating fluid in the vessels of the body increases, while its quality decreases; in other words, there exists a combined hydremia and anemia. In proportion as the red corpuscles diminish the white corpuscles increase in quantity, and the amount of fibrinogen is increased, so that the blood shows a greater tendency to clot. This is another of nature's provisions to prevent the occurrence of postpartum hemorrhage, by favoring a rapid formation of thrombi in the lacerated uterine sinuses. The increase in the total amount of blood causes a corresponding increase in the arterial tension and imposes an additional strain upon the heart; consequently, there is soon produced a

condition of hypertrophy and dilatation of the left ventricle, which, in a moderate degree, should be regarded as normal during gestation; it generally promptly disappears after labor. The heart is said in this way to be increased in weight about one-fifth.

(2) *Respiratory System.*—The distention of the abdominal cavity causes upward displacement of the diaphragm, which impinges upon the lungs and gives rise to a certain amount of embarrassment of respiration. This is partially relieved by the settling of the uterus just prior to labor. As might be expected from the vitiated condition of the blood, the quantity of carbonic-acid gas discharged by the lungs is increased.

(3) *Urinary System.*—The urine shows some very characteristic changes during gestation. The hydremia and increased arterial tension result in the excretion of an excessive amount of a watery urine of low specific gravity, which is voided at frequent intervals; thus is produced one of the well-recognized and important clinical manifestations of early pregnancy, frequency of micturition. There is no alteration in the normal amount of urea and solids excreted, but simply an increase in the aqueous element. Traces of albumin, as well as of sugar, are frequently found. The albuminuria when not due to renal insufficiency is probably a sequence of slight vesical catarrh. With rare exceptions the glycosuria is, in reality, a lactosuria dependent upon the absorption of lactose from the breasts. The *gravidin* or *kyestein test* is no longer regarded as diagnostic of pregnancy. *Gravidin* (*kyestein* or *kiestin*) is a peculiar substance occurring in white transparent globules on the surface of the urine voided, it was formerly thought, by pregnant women exclusively. It is now known to form in urine from men and non-pregnant women under various conditions, and has therefore lost any pathognomonic signification. Histologically, it is composed of triple phosphates, fat-globules, a peculiar form of albumin, and fungi. It is

most commonly found in the urine voided between the second and seventh months of pregnancy.

(4) *Osseous System.*—Softening of the bones to a slight extent is apt to occur during pregnancy, and the true pathologic osteomalacia will in rare instances be developed; in fact, this interesting disease is claimed by many medical authorities to have its origin exclusively in pregnancy. The deposition of osteophytes on the inner cranial plate has been noted; in composition these are mainly the salts of lime (carbonate, phosphate); they are not peculiar to pregnancy.

(5) *Nervous System.*—Alterations in taste and disposition and a tendency to vertigo, syncope, and neuralgias, all of a transient nature, are of frequent occurrence. The so-called irritable uterus is very prone to be developed in neurotic primiparæ.

(6) *Digestive System.*—The appetite becomes capricious, and pica (longings, pining) may be present, especially in the first two or three months of pregnancy. In consequence, there is, at this time, a temporary loss of body-weight; toward the close of gestation, however, in most women, the weight is increased by the deposition of fat throughout the tissues. The salivary glands become more active. The liver may contain fatty deposits, as has been demonstrated by post-mortem examinations made upon women dying from some accidental complication during the later months of pregnancy.

V. THE CLINICAL MANIFESTATIONS, THE DIFFERENTIAL DIAGNOSIS, AND THE HYGIENE OF PREGNANCY.

Necessarily, a process of so great significance as gestation, and one associated with such manifest alterations in the organism of the woman, must be attended by certain signs or symptoms which, while perhaps not absolutely

pathognomonic of the existing condition, are at least strongly suggestive. It becomes, therefore, of paramount importance that the practitioner acquaint himself with these signs in order that an early recognition of the condition may be had. It is only by a knowledge of the physiologic changes just enumerated that any rational explanation of the clinical manifestations of pregnancy can be advanced, and even with this knowledge an early absolute diagnosis in many cases cannot be made. In every instance, however expert the obstetrician may be, a positive diagnosis before the second month is almost impossible. Nothing can be more disastrous than an error in diagnosis in which pregnancy is confounded with some pathologic condition, and *vice versâ;* not only is the professional reputation of the diagnostician imperilled or even ruined, but incalculable suffering and lasting sorrow may be inflicted upon the patient and her family and friends. We have repeatedly seen celiotomy performed in the expectation of removing a pathologic growth of the uterus, and an existing gestation revealed, and again a woman declared to be in an advanced stage of pregnancy while actually suffering from malignant disease of the ovary, as demonstrated by subsequent operation. The importance, therefore, of a close investigation of the signs of pregnancy cannot be too strenuously urged.

The Signs of Pregnancy.

For convenience in study these signs may be grouped as follows: 1. Uterine; 2. Vaginal; 3. Abdominal; 4. Pressure-symptoms; 5. Mammary Changes; 6. Cutaneous; 7. Reflex; 8. Fetal.

Uterine Symptoms.—An interesting group of phenomena are centered in this organ during the period of fetal development from inception to parturition. They are as follows:

(1) *Cessation of Menstruation.*—This is an early sign, regarded by the laity as of great significance, especially

when regularity in menstruation has hitherto been the rule. Although of considerable value, *it is not an absolute sign* of pregnancy, for the menses may persist for the first two or three months of gestation, and occasionally throughout the entire period, without arrest of embryonic development. This persistent bleeding is very generally dependent upon some pathologic condition, such as the existence of cervical endometritis or of mucous polyps. In certain cases it may follow failure of union of the deciduæ vera and reflexa. An interesting query concerns the probable *cause* of the menstrual suppression of pregnancy. Various theories have been advanced, the most plausible of which is mechanical interference to the escape of the blood. Thus in early pregnancy the extreme decidual hypertrophy so surrounds the mucosal blood-vessels that the customary escape of blood through their walls is prevented. Later, after the third month of gestation, owing to the union of the two layers of the decidua, the uterine cavity is entirely obliterated and another mechanical obstacle to menstruation arises. In addition, it is probable that the customary periodic engorgement of the pelvic viscera is absent, hence the predisposition toward menstruation fails. *Other Causes of Suppression.*—Among the other causes of menstrual suppression may be mentioned: 1. Mental emotion, as when illicit intercourse has been indulged in, or following excitement due to the novelty of the marriage relation; 2. Cold, as from sea-bathing during a menstrual epoch; 3. Extreme physical fatigue; 4. Various debilitating diseases, as pulmonary tuberculosis, anemia, and chlorosis; 5. A change of climate, a common cause of amenorrhea in young Irish girls lately arrived in this country; 6. Certain mental diseases (mania, hysteria); 7. Local trouble, such as chronic inflammation of the perimetritic tissues or an ovarian tumor; 8. Lactation. Finally, it must be remembered that it is possible for conception to occur before the establishment of menstruation, and that in many cases women who

are desirous of bearing children will claim menstrual suppression when it is not actually existing.

(2) *Progressive Growth of the Uterus* (Fig. 36).—This is also a fairly presumptive sign of pregnancy, although not an absolute one. *The Tumor of Pregnancy.*—The pregnant uterus is at first ovoid, with a marked increase in the anteroposterior diameter, and this peculiar alteration in shape is a very important sign of early pregnancy. Later the uterus becomes pear-shaped, with the larger end above. It occupies a median position, with a slight inclination to the right; its growth is rapid and progressive; its surface is smooth and regular; its consistency is soft and elastic, the anterior wall being softer and looser than the posterior, this probably having some relation to the attachment of the placenta; the fundus is directed anteriorly and is freely movable. The vaginal portion is drawn up, the vagina elongated, and the anterior vaginal wall appears tenser than normally. By observing the progressive increase in the height

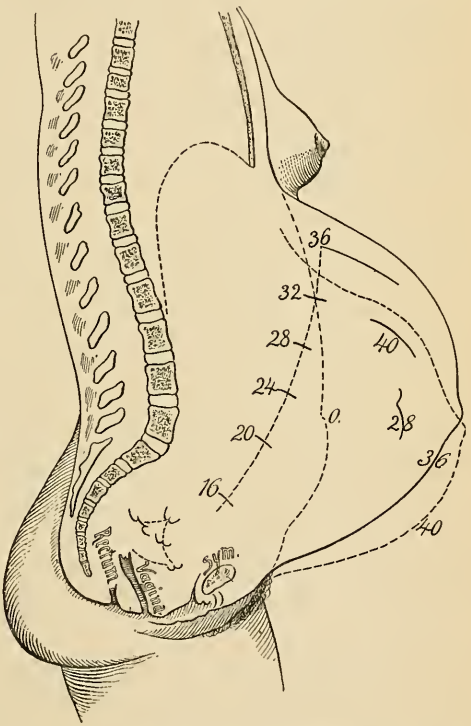


FIG. 36.—Diagram showing the progressive growth of the uterus during pregnancy, the height of the uterus being marked in weeks.

of the fundus uteri above the symphysis pubis an approximate idea as to the duration of the pregnancy may be ascertained. At the second month of gestation the fundus is about on a level with the top of the symphysis pubis; at the fourth month it is midway between this point and the umbilicus; at the sixth month it has reached the umbilicus; at the seventh month it is midway between this point and the ensiform cartilage of the sternum; at the eighth month it has just about reached this cartilage; and at the ninth month it has fallen again to almost the situation occupied at the seventh month. *Other Causes of Uterine Enlargement.*—Enlargement of the uterus simulating gestation may be the result of—1. Subinvolution following a previous pregnancy; 2. A non-nodulated fibroid tumor; 3. Inflammation of the uterine and periuterine tissues.

(3) *Braxton Hicks' Sign.*—This is an exceedingly valuable and almost positive sign of pregnancy. It can be detected at the beginning of the fourth month of gestation, and consists in a rhythmic and painless contraction of the uterine walls, occurring at irregular intervals, once in from five to twenty minutes, and lasting for from a half to one minute. It may be elicited by simply grasping the uterus without any effort at massage or pressure; upon making such a maneuver the alternate hardening and relaxation may be noted. It is never absent in pregnancy whether the fetus be living or dead, but may be present in other conditions. These contractions aid in maintaining the position of the fetus and prevent stagnation in the uterine and placental circulations. *Other Causes of Rhythmic Contraction.*—The other conditions in which this sign may be elicited are—1. Uterine myoma and fibroma; 2. Distention of the uterus by retained menses or by an intrauterine polyp.

(4) *Uterine, Abdominal, or Placental Souffle or Bruit.*—This is a very constant but *non-diagnostic sign* of pregnancy. It consists in a rhythmic *whishing* sound occurring synchronously with the maternal heart-beat. It is first heard about

the beginning of the fourth month, and its location at this time is usually in the median line just above the symphysis pubis; later in pregnancy it may be heard low down and to one or the other side of the uterus. Pressure of the stethoscope will modify its intensity, as will also the uterine contractions during labor. It was formerly thought to be due to the rushing of the blood-currents through the placental tissues—hence the term *placental bruit* or *murmur;* it may be heard, however, for some days after the birth of the placenta, and is now known to be produced by the entrance of the blood into the uterus through the enlarged uterine arteries. While commonly heard over but a limited space on one side of the abdomen, it may be detected over both uterine arteries or even over the entire surface of the uterus, and is generally most pronounced in anemic individuals, thus agreeing with the general rule governing the production of inorganic blood-murmurs. It may be that its existence is dependent entirely upon the hydremic condition that, to a moderate degree, is physiologic during pregnancy. *Other Conditions in which the Bruit is heard.*—The uterine bruit may occasionally be detected in women suffering from large uterine fibroids, and, very rarely, in ovarian tumors of considerable size.

Abdominal Signs.—By the abdominal signs are meant those changes occurring during pregnancy in the maternal abdomen. They include—

(1) *Progressive Enlargement and Protrusion.* — This is necessarily an important sign of pregnancy, but *not diagnostic.* It is dependent upon the corresponding increase in the size of the uterus, and first becomes noticeable about the fourth month. It is most marked in women of small stature. *Other Conditions producing Abdominal Enlargement.*—This abdominal growth may be the result of—1. Ascites; 2. Uterine fibroids; 3. Ovarian cystomata; 4. Tumors of the abdominal viscera; 5. Excessive deposition of fat in the abdominal parietes; 6. Tympanites.

(2) *The Striæ* (Fig. 37).—The striæ are the purplish lines of discoloration described under the Physiology of Pregnancy. They are most marked in the iliac regions and toward the flanks. *They are not diagnostic of pregnancy*, but may result from any excessive distention of the abdominal walls.

Fig. 37.—Striæ, or lineæ albicantes (Auvard).

(3) *Changes in the Umbilicus.*—Until the sixth month the umbilicus retains its depressed condition, although gradually rising toward the surface of the abdomen as the uterine tumor increases in dimensions; at the sixth month the navel reaches the level of the surrounding surface, and from this time on to term the protrusion becomes steadily more and more marked.

(4) *Pigmentation.*—The general pigmentation of the skin is especially marked upon the abdomen. Starting at the labia majora—which, as a rule, become quite dark—there is a line of discoloration running up the middle of the abdomen to the ensiform cartilage; the linea alba is thus transformed into the *linea nigra* or *fusca*, which in color varies from yellow to dark brown. Around the umbilicus there is also a ring of darkened tissue. This discoloration is most marked in brunets, and may be present to only a slight degree in blonds. Dr. Adsersen of Copenhagen, however, has examined 200 children, boys and girls, ranging in age from fourteen days to thirteen and a half years, for the existence of this pigmented line, and in 128 was the linea fusca found. Of these 76 were girls and 52 boys. It frequently increased with age; in half the color was quite pronounced, in the remainder only indistinct. Adsersen concludes that this line of pigmentation should not be included among the charac-

teristic signs of pregnancy. *Other Conditions in which Discoloration is Present.*—A discoloration closely simulating that of pregnancy may be noted—1. In ovarian disease; 2. At the menstrual epochs; 3. In uterine myomata.

(5) *The Percussion-note.*—Upon percussing the abdomen of the pregnant woman there is elicited dulness over the position of the uterus, with tympany above and to the sides, where the intestines have been displaced—the so-called "*coronal resonance.*" Occasionally a loop of bowel may slip down in front of the uterus and become adherent; in such a case the normal area of uterine dulness will be masked to a degree corresponding to the amount of bowel that is displaced.

(6) *Abdominal Ballottement.*—This is an absolute sign of pregnancy. It may be elicited as follows: The uterus being steadied by the two hands placed one on either side of the abdomen, an impulse is given by one hand, when the fetus is felt to impinge upon the opposite hand; the shock is more distinct when the fetus is small and undersized. By *cephalic ballottement* is meant a similar sign elicited only in breech presentations. It is a form of abdominal ballottement in which the movable fetal head is impelled from one side of the uterine cavity to the other by the hands placed firmly upon the lateral abdominal surfaces. Another method is to place the fingers over the fetal head and by a sudden movement depress the abdominal wall; the head is displaced, and on returning to its original position impinges against the fingers with an appreciable shock.

Pressure-symptoms. — It is patent that the rapidly-growing tumor within the abdominal cavity must impinge to a greater or less extent upon the surrounding structures. There are thus evolved a series of pressure-symptoms of considerable moment. These are as follows:

(1) *Irritation of the Bladder.*—Frequent micturition is one of the earliest and most important diagnostic features of pregnancy. It is invariably present in the first few weeks

of gestation, and is dependent upon the pressure exerted by the enlarged fundus upon the base of the bladder. Later in pregnancy there may be a retention of urine from pressure upon the urethra, with elongation of the latter organ, the bladder being carried upward by the growing uterus.

(2) *Constipation.*—The constipation that may become an exceedingly prominent symptom of pregnancy is nothing more than an exaggeration of the normal condition in woman, produced by a stagnation in the pelvic circulation and by direct mechanical pressure of the enlarged uterus upon the rectum and sigmoid flexure. It may assume a pathologic significance, of which further mention will be made in its proper place.

(3) *Varicosities.*—Varicose veins are a very common attendant upon pregnancy, although many women will pass through a succession of gestations without developing any appreciable enlargement of the veins. When present they may have a duplex origin. They result in part from a general slowing of the pelvic circulation, with consequent engorgement of all the pelvic viscera and a damming back of the blood in the enlarged veins, and in part from direct pressure of the pregnant uterus upon the engorged pelvic vessels. Generally the varicose condition is first manifested in the appearance of hemorrhoids, from which many patients suffer severely. If the condition becomes aggravated, the veins of the vulva and of the legs distend, often to an enormous extent. We have seen in a Hungarian woman a mass of varicose veins as large as a man's fist pendent from the right labium. A curious feature noticed by some writers is that varicose veins of the legs are commonest upon the left side, and when present upon both limbs are more marked upon that side (H. C. Bloom). This is by no means invariably the case. The veins of the bladder may partake in the general distention, and should rupture of one of these veins occur, hematuria will be produced.

(4) *Nerve-symptoms.*—Pressure exerted by the tumor of

pregnancy upon the sacral plexus of nerves and its numerous branches is common during the later months of gestation. The painful cramps of the limbs noticed at this time and during labor are so produced, and many patients will complain of numbness or "*dead limbs*" from a similar cause. These distressing neuralgic manifestations may become the dominant pathologic feature of a given case.

Vaginal Signs.—An examination *per vaginam* of a woman presumably pregnant is always essential in order to arrive at positive conclusions as to the existing condition. By this method of examination many important signs can be elicited. For its successful performance the patient should assume the lithotomy position, with the limbs well separated; she should be instructed to lie in as relaxed a condition as possible. The points to be noted are the following:

(1) *Jacquemin's Sign.—Purplish discoloration of the vaginal and vulvar mucosæ* is an extremely valuable sign that may be recognized as early as the sixth week, though frequently it is not well developed before the beginning of the third month of pregnancy. It is dependent upon the congestion of the superficial blood-vessels of the parts. The coloration increases in intensity as the pregnancy advances; it is deeper within the vagina, and shades off to a mere bluish tint of the vulvar mucosa in the earlier months, although toward the close of gestation in some cases the labia may be of a deep-blue or purple color. The purplish hue usually is most intense just beneath the urethral orifice, and digital pressure here may detect the increased vascularity long before the discoloration becomes marked elsewhere. This pigmentation may be regarded as an *almost absolute sign* of pregnancy. It may rarely be produced by other causes of intense pelvic congestion, such as neoplasmata of various kinds; it is quite exceptional, however, for these conditions to produce such an intense congestion as to give rise to vaginal or vulvar discoloration.

(2) *Osiander's Sign.—The vaginal pulse*, a sign which, while not absolutely diagnostic of pregnancy, is very frequently to be detected, and which may be regarded as a valuable presumptive symptom of early pregnancy, consists in a distinct pulsation of the vaginal arteries consequent upon the high arterial tension of the part. While present at an early period in many patients, in others it may be absent throughout gestation. *Other Causes of Vaginal Pulsation.*—Pulsation of the vaginal arteries may occasionally be noted in connection with uterine fibroids, and very rarely in inflammatory uterine diseases.

(3) *Leukorrhœa.*—This is always present in a greater or less degree as a consequence of the edema and vascular condition of the parts. It is necessarily non-diagnostic, and is of but slight import, other than giving rise occasionally to considerable discomfort to the patient.

(4) *Temperature.*—A sensation of increased warmth in the genitalia is a minor subjective manifestation of the condition of pregnancy. *Other conditions* causing local rise of temperature are—1. Vaginitis; 2. Congestive diseases of the pelvic viscera.

(5) *Goodell's Sign.—Velvety softness of the cervix uteri* is a truly valuable, although not absolutely diagnostic, sign of gestation, resulting from the edema of the tissues of the cervix. It may be present as early as the second or third week of pregnancy. Professor Goodell formulated a so-called ready rule of practice as follows: When the cervix is as hard as the tip of one's nose pregnancy presumably does not exist, but if it be as soft as one's lips, the existence of pregnancy is probable. In this softened cervix in multiparæ the finger may be readily introduced for some distance into the cervical canal, but this is impossible in primiparous women. *Other conditions in which softness of the cervix may exist* are—1. At the menstrual epoch; 2. In some uterine tumors; 3. In advanced endometritis.

(6) *Hegar's Sign* (Figs. 38, 39, 40).—*Softening and*

compressibility of the lower segment of the uterine body are regarded by many as almost diagnostic of early pregnancy. The sign may be obtained by bimanual palpation, the hands being placed in either of the several positions shown in the illustrations.[1] Thus, it may be elicited by passing the index finger of the left hand far up into the rectum and the thumb into the anterior vaginal fornix, at the same time pressure being exerted above with the right hand upon the abdomen between the symphysis and the fundus. This method may be facilitated by hooking down the cervix with a tenaculum. Another method is to place the index finger in the posterior vaginal fornix while counter-pressure is made with the opposite hand upon the uterus through the abdominal wall just above the symphysis, the uterus being strongly retrodisplaced. The third method consists in pressing the index finger of the left hand into the anterior vaginal fornix, while the right hand is forced down behind the fundus and in front of the sacrum. The sensation imparted to the examiner is that of two distinct bodies, the cervix below and the

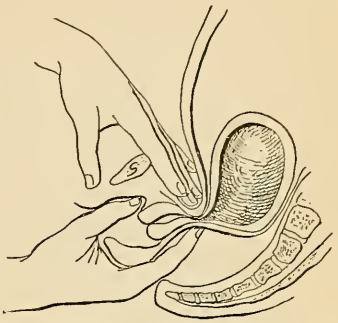


FIG. 38.—First method of eliciting Hegar's sign of pregnancy (Sonntag).

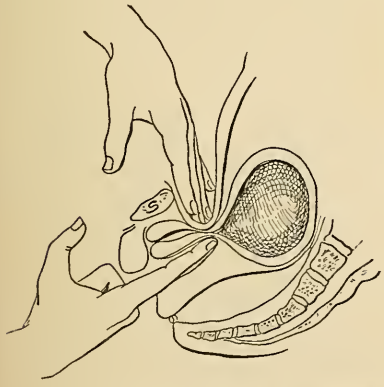


FIG. 39.—Second method of eliciting Hegar's sign of pregnancy (Sonntag).

[1] *Am. Jour. of Obs.*, Aug., 1892.

uterine body above, united by an area of softened tissue, the lower uterine segment; this is caused by the thinning and edematous condition of this segment. Between the second and fifth months of gestation Hegar's sign may be regarded as one of great value. It may be recognized in 30 per cent. of the cases. In order to properly elicit it, however, anesthesia is often necessary, and the abdominal walls must be thin and flaccid enough to permit of the uterus being grasped between the two hands. *Other Conditions in which this Sign is found.*—Certain pathologic conditions of the uterus, notably uterine fibroids or myomatous growths, may occasionally produce such softening of the lower segment of the uterus as to closely simulate this sign of pregnancy.

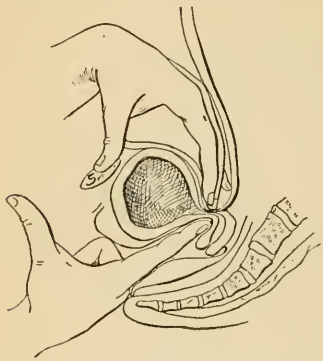


Fig. 40.—Third method of eliciting Hegar's sign of pregnancy (Sonntag).

(7) *Ballottement.*—One of the so-called absolute signs of pregnancy, available only from the middle of the fourth to the eighth month, is that known as *ballottement.* It may be performed vaginally or abdominally; the latter has already been described under the abdominal signs of pregnancy. *Vaginal Ballottement* (Fig. 41).—The patient resting in the semirecumbent position, with the hips over the edge of the table and the shoulders well elevated in order

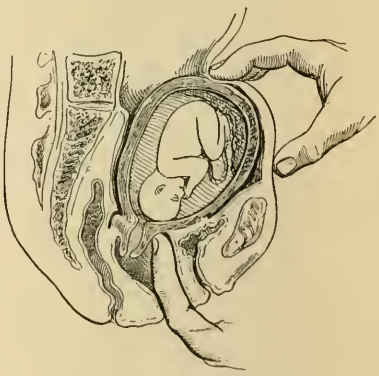


Fig. 41.—Vaginal ballottement.

to secure the action of gravity, the index and middle fingers of the left hand are passed up into the anterior vaginal fornix, while the fundus is steadied by the right hand placed upon the abdomen. A sudden impulse is now given to the anterior uterine wall by the vaginal fingers; the fetus is displaced upward into the liquor amnii, and gently falls back again in a moment or two, in so doing striking softly upon the propelling fingers. The blow thus received constitutes the sign of ballottement. *Other Conditions producing a Similar Sensation.*—In association with the other manifestations of pregnancy this is an absolute sign. There are other conditions, however, which, to a careless observer, may simulate it. These are—1. A fibroid tumor with a long pedicle; 2. A calculus in the bladder; 3. A strongly anteflexed fundus uteri; 4. An ectopic pregnancy of a certain degree of development; 5. A small ovarian cyst with a long pedicle.

(8) *Rasch's Sign.—Uterine Fluctuation.*—This may be detected as early as the second month of gestation. It is elicited, as in ballottement, by two fingers of the left hand placed in the anterior vaginal fornix, the uterus being steadied above by the right hand; gentle tapping by the fingers above will impart the sensation of fluctuation to the vaginal fingers, the wave being transmitted through the liquor amnii. Rasch considers this an important sign of pregnancy.

(9) *Fetal Presentation.*—During the last three months of pregnancy the examining finger in the vagina will be able to detect the presenting fetal part through the roof of the vaginal vault. This, of course, is absolutely diagnostic.

Cutaneous Manifestations.—*Pigmentation.*—An inspection of the face of a pregnant woman will reveal, especially if she be a brunet, certain patches of pigmentation termed *chloasmata*, *liver-blotches*, or *liver-patches*. These are most marked upon the forehead and cheeks, and are usually associated with dark circles about the eyes. The pigmentation of the abdomen has already been noted. The diag-

nostic value of these spots is slight. In some instances the pigmentation persists after labor. *Other Conditions producing Pigmentation.*—The same cutaneous discoloration may be produced by—1. Menstruation; 2. Uterine and ovarian disease.

Sympathetic and Reflex Manifestations.—The radical changes in the maternal system during pregnancy must of necessity be productive of widespread and varied sympathetic disturbances, some of which are, indeed, very characteristic of the pregnant state. In the order of their importance these may be stated as follows:

(1) *Nausea and Vomiting, or "Morning Sickness."*—This is a valuable reflex symptom dependent upon irritation of the peripheral uterine nerves consequent upon progressive stretching of the uterine muscular fibers. It is usually present about the sixth or seventh week of pregnancy, although in some instances it may immediately follow conception and in other instances be entirely absent. Giles[1] estimates that one-third of all pregnant women are free from morning nausea during the entire pregnancy, and that 45 per cent. remain free from it during the first three months. If it occur, it presents itself in 70 per cent. of the women in the first month of pregnancy, seldom in the second, third, or fourth months, and very rarely in the fifth and sixth months; in from 9 to 10 per cent. it begins in the last three months of gestation. Its duration varies from a few days to throughout the entire pregnancy, but it is rarely protracted beyond the fourth month. The nausea may be slight or severe, and appears generally immediately on rising, hence its popular name; it may occur, however, at any time during the twenty-four hours, and especially after the ingestion of food. When exaggerated it constitutes a serious pathologic condition. *Other Causes of Nausea and Vomiting.*—This is not an absolute sign of pregnancy, for it may be caused by other conditions, such

[1] *Prov. Med. Jour.*, Aug., 1893.

as—1. Uterine displacements; 2. Uterine tumors; 3. Retention of menstrual blood from atresia or other causes; 4. Endometritis and metritis; 5. Ovarian and tubal congestion and inflammation; 6. Chlorosis; 7. Associated gastrointestinal disease.

(2) *Alterations in the Nervous System.*—A multitude of nervous phenomena attend the progress of gestation. Prominent among these are *changes in disposition.* Frequently will the patient be fretful, irritable, or despondent, and in some cases an exaggeration of these nervous phenomena will result in temporary mental derangement assuming the form of melancholia or mania. Closely allied to these changes is the morbid craving for strange and disgusting articles or for certain kinds of food (pica, longings, pining). The patient may develop a marked tendency to syncope and fainting fits, and especially may this occur when for some reason the nausea and vomiting have not occurred. Neuralgic pains are of frequent note. The patient may suffer from toothache or tic douloureux, or she may have violent cramp-like pains in the extremities. The so-called *Beccaria's sign* of pregnancy belongs to this class of phenomena, and is an intense pulsating pain in the occipital region.

(3) *Cardiac Symptoms.*—Owing to the increased amount of circulating fluid, with compensatory hypertrophy of the left ventricle, the woman's pulse generally becomes somewhat accelerated. A pulse of 90 or 94 beats per minute is quite a common occurrence, and this may be associated with a very annoying sensation of throbbing and palpitation. *Jorisenne's sign* of pregnancy is the absence of acceleration of the pulse-rate noticed when the patient assumes the erect posture after resting for some time in the recumbent position; it is of doubtful accuracy. The cardiac symptoms are all more or less dependent upon the hydremic condition of the blood.

(4) *Glandular Activity.*—During pregnancy the entire

glandular system of the body shows increased functional activity. This is especially noticeable in the salivary glands, which throw out an abundant watery secretion. When this becomes exaggerated the salivation of pregnancy is produced.

Mammary Changes.—The mammæ show an important series of changes that is strongly suggestive of the existence of pregnancy, although not absolutely diagnostic. These changes are all especially well marked in primiparæ, and are as follows:

(1) *General Enlargement.*—By the second month of gestation the breasts have begun to enlarge and to become firm and heavy from the hyperplasia of the glandular, adipose, and connective tissues that is taking place. This excessive growth is required in order that the breasts may be prepared to assume functional activity after the birth of the child. It is associated with a pricking sensation and a feeling of fulness, especially in and around the nipples. In addition, the superficial veins become prominent, greatly enlarged, and tortuous, and in advanced pregnancy white, glistening streaks (*lineæ albicantes* or *striæ*) appear upon the surface of the mammæ; they are produced by excessive stretching of the cutaneous structures, and are permanent. Palpation of the enlarged mammæ show them to be generally hard, with here and there peculiar knotty formations, especially prominent around their bases.

FIG. 42.—Primary areola, elevated and edematous (PA), with follicles (in a blond).

(2) *Pigmentation* (Figs. 42, 43).—A deposition of pigment takes place in the areola, which becomes broader and more

distinct (*primary areola*). The color varies from a beautiful pink in blonds to a dark brown in brunets. During the latter half of pregnancy pigmented spots of a lighter shade may be developed around this areola, forming the so-called *secondary areola*. This is not constantly present.

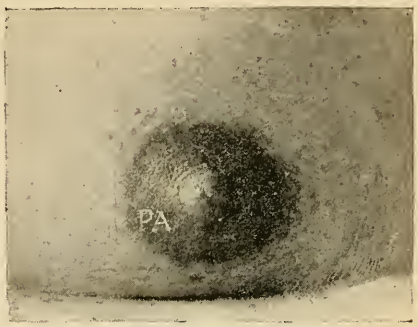


FIG. 43.—Primary areola, pigmented (PA), but flat, with small nipple (in a brunet).

(3) *Enlargement of the Glands of Montgomery*.—There exists in the immediate vicinity of the nipple a number of glandular structures known as the *glands of Montgomery*. Their function is to secrete a sebaceous material which is destined to lubricate the nipple. After the commencement of pregnancy these glands take on a renewed growth, and appear as little projections in the primary areola which are called the *tubercles of Montgomery*. These constitute an exceedingly valuable sign of pregnancy, and their presence, especially in primiparæ, warrants a strong suspicion of its existence.

(4) *The Nipples*.—During pregnancy these increase markedly in size and become prominent and protruding; they readily become erect and turgid, and are often covered with bran-like scales of desiccated colostrum.

(5) *Development of Colostrum*.—From the third month on to the termination of pregnancy the breasts are filled with a sero-lactescent fluid known as *colostrum* (Fig. 44); it contains a large number of small microscopic bodies, the *colostrum-corpuscles*, which are the desquamated epithelial cells of the mammary glands filled with oil-globules. This material persists within the lactiferous tubules until the third day of the puerperium, when the colostrum corpuscles rup-

ture before being discharged from the glands, and milk is formed. The presence of colostrum in the breasts of primiparous women is an almost absolute sign of pregnancy, but in multiparous women its diagnostic value is not so great. Colostrum contains a laxative albuminous substance, and this is valuable in causing an evacuation of the meconium immediately after birth.

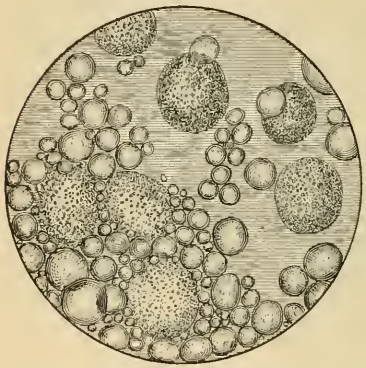


FIG. 44.—Colostrum and ordinary milk-globules, first day after labor; primipara aged nineteen.

Fetal Symptoms.—Under this caption are included those signs that are directly connected with the fetus itself, and that are not reflex manifestations of its existence revealed through the maternal organism. The fetal symptoms are:

(1) *Quickening and Fetal Movements.*—By *quickening* is meant the first fetal movement detected by the mother. It usually occurs about the middle of the fourth month of gestation, but in rare instances it may be felt as early as the third month. It has been described as a fluttering sensation simulating the movements of a bird; it has also been likened to a vermiform movement, as in peristalsis. The legal view that until the experience of quickening the fetus is not endowed with life is incorrect. It is probable that there have been fetal movements from the first development of the muscular structure of the embryo, but that these movements cannot be appreciated by the mother until the uterus has attained sufficient size to come into contact with the abdominal walls. Quickening having once occurred, the subsequent sensations are to be designated as *fetal movements*, an absolutely diagnostic sign of pregnancy. Quicken-

ing, which is an entirely subjective symptom, cannot be verified by the obstetrician; hence it is not a positive, though it is a valuable, sign of pregnancy. Peristaltic movements of the intestines, the presence of intestinal flatus, and involuntary contractions of the abdominal muscles may very closely simulate the fluttering sensation. Fetal movements, however, which may be both felt and seen by the physician himself, cannot be mistaken for anything else. These movements steadily increase in force and frequency as gestation advances; they are of two distinct varieties. Thus there may be noticed a peculiar undulatory movement advancing across one side of the abdomen as the swell of a wave; such a movement is produced when the fetal ellipse is elongated, as when the fetal back is straightened. The second variety of fetal movements consists in distinct blows as from the spasmodic movement of one of the fetal limbs, and in women with thin abdominal walls actual protrusions of the abdomen may be seen. The movements are not constantly present, but may be entirely absent for days without fetal death having occurred. Prolonged fasting, certain recumbent positions, and forcible palpation of the abdomen may aggravate the movements, while hydramnios and extreme ascites may conceal them. At times the movements of the fetal limbs in the liquor amnii or in contact with the uterine walls will give rise to peculiar, faint, indescribable sounds which, if distinctly heard, are characteristic of pregnancy. It is the exception, however, to detect such sounds, as they either occur very irregularly or are altogether absent. When detected there is first heard a peculiar murmur or bruit resulting from the disturbance of the liquor amnii by the movements of the fetal limbs; this is termed the *bruit de choc fétal*, and immediately precedes the *choc fétal*, or sound of the fetal movements detected upon ausculting the abdomen; this sound has been likened to that produced when one hand, pressed upon the ear, is lightly percussed by a finger of the other hand. As has already

been said, it is rarely heard, and possesses no especial diagnostic value.

(2) *Mayor's Sign.—The fetal heart-sounds* constitute an absolute sign of pregnancy, first pointed out by Mayor in 1818. They may be detected at the beginning of the fifth month, from this time the sounds steadily growing in intensity as gestation advances. The sound produced by the fetal heart has been compared to the muffled ticking of a watch placed under a pillow; the rate is about twice that of the maternal heart-beat, averaging from 120 to 160 beats per minute, the frequency depending upon the size and sex of the child, and, in labor, upon the presence of the pains. The beats are more rapid in feeble and female children, while during the height of the uterine contraction they diminish in frequency from the asphyxia produced by the interference with the placental circulation. In counting the fetal heart-beats the hand should always be placed at the same time upon the mother's pulse. A sign of fetal danger is marked slowing or irregular action of the heart. *Conditions in which the Sounds are Faint or Absent.*—The fetal heart-sounds may be quite indistinct or entirely absent under certain conditions, such as the following: 1. Very fat abdominal walls; 2. Posterior position of the fetal back (it must be borne in

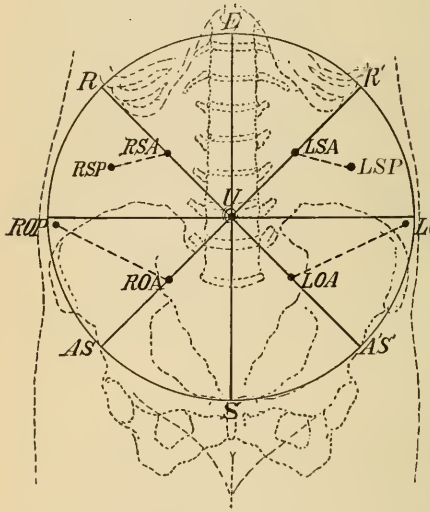


FIG. 45.—Diagram illustrating the points of maximum intensity of the fetal heart-sounds in vertex and breech presentations.

mind that the heart-sounds are best heard over the fetal back); 3. Hydramnios; 4. An excessive amount of flatus in the intestines; 5. Fetal death. *Position where Best Heard.*—The position of maximum intensity varies according to the fetal presentation. In listening for the sounds the patient should be placed in the semi-prone position with the knees flexed. Whatever the position occupied by the fetus, the sounds, as a rule, can be detected in any one case over but a limited space, possibly covering not more than from 2½ to 5 cm. (0.98425 to 1.9685 in.) of the abdominal surface. A *general rule* for finding the sounds may be formulated thus: Let two imaginary lines be drawn through the umbilicus to either anterior superior iliac spine, and these lines be continued upward to the margin of the ribs (see Fig. 45). In anterior vertex presentations the sounds will be best heard at a point midway between the umbilicus and the spinous process of that side upon which the fetus is resting, while in posterior vertex presentations their point of maximum intensity will be in the corresponding flank, slightly below a transverse line passing through the umbilicus. In anterior breech presentations they will be heard best at a point midway between the umbilicus and the margin of the ribs on the side corresponding to the fetal position, and in posterior breech presentations slightly back of this point.

(3) *Kennedy's Sign.—The Umbilical or Funic Souffle.*—This is a peculiar high-pitched hissing or blowing sound, heard most distinctly in the immediate vicinity of the fetal heart, with the beat of which it is synchronous. It is probably produced within the umbilical arteries, and is regarded as a sign of fetal danger. It is believed to indicate extreme tension of the funis, as when the latter is knotted or twisted around the fetal neck, or compression of the cord by a fetal part. As a diagnostic sign of pregnancy it possesses but slight value.

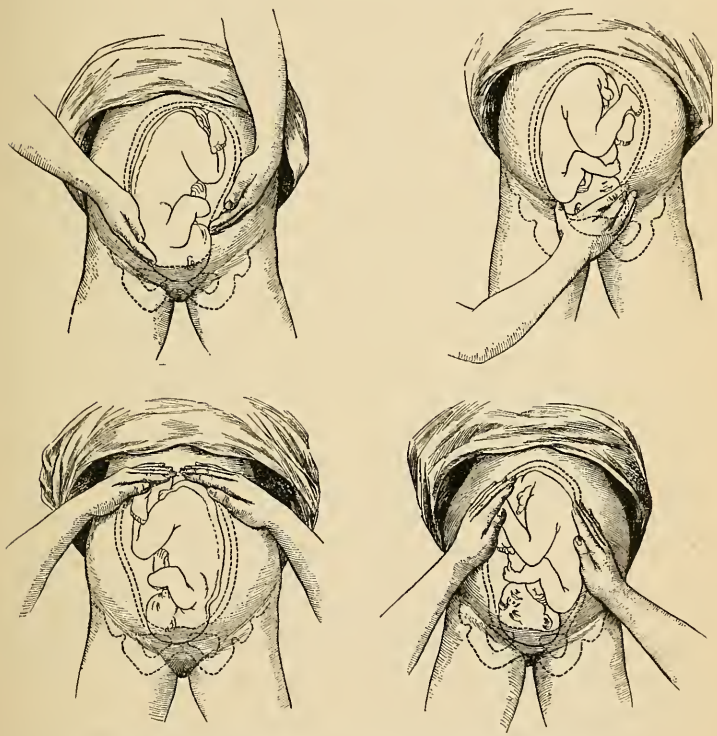
(4) *Delineation of the Fetal Parts.*—Late in pregnancy

palpation of the abdomen will enable the obstetrician to detect the outlines of the fetal body. The diagnosis of pregnancy will have already been made, and this delineation will be but confirmatory.

The Diagnosis of Pregnancy.

(1) The diagnosis of the existence of pregnancy will be made by reference to the signs as just enumerated, many of which will be present in any given case. While, considered separately, some of these signs would not be absolutely diagnostic, when taken in combination with others a fairly presumptive diagnosis of gestation may be made. In order to recognize these various signs the senses of sight, touch, and hearing must be put into requisition. By *inspection* of the patient's body may be noted the pigmentations of the skin and vaginal mucosa, the changes in the size and appearance of the breasts and nipples, the enlargement of the abdomen, and, at times, the fetal movements; by *auscultation* the fetal heart-sounds and the uterine and funic souffles may be detected; while by the sense of *touch* may be determined the size and outlines of the uterine tumor, Hicks' sign, the fetal outlines and movements, and the various vaginal signs, including ballottement, Hegar's and Goodell's signs, vaginal pulsation, and the outlines of the presenting part. In performing abdominal palpation (see Figs. 46–49) the woman lies in the dorsal position, with the thighs partly flexed and the shoulders slightly elevated. Care should be taken to have the bladder and rectum emptied before attempts are made to palpate the abdominal surface. Facing the head of the bed, the obstetrician with warmed fingers applies the hands to the abdomen and makes gentle pressure downward and inward with the ulnar borders of the palms, at the same time slowly moving the hands from the median line toward the flanks. In this way may be determined the size of the uterus, its tonicity, the situation and size of the fetus, and its position. By reversing,

now, his stand and facing the foot of the bed, the presentation, whether cephalic or pelvic, may be determined by the examiner. In order to do this he places the middle finger at the central points of Poupart's ligament on either side,



FIGS. 46–49.—Leopold and Spörlin's methods of abdominal palpation.

and allows his fingers to sink within the pelvic brim, when, if the head be presenting, it may be recognized as a hard, rounded, and non-compressible mass. The latter may, at the same time, be caused to sink into the pelvic inlet, and the approximate proportion of the head and inlet thus be estimated.

The signs to be looked for vary with the period of preg-

nancy to which the woman has advanced. For convenience in clinical examination pregnancy has been divided into three three-months periods or trimesters, each of which has its own peculiar manifestations. In the first half of the first trimester an absolute diagnosis of pregnancy is not possible; before the expiration of the three months, however, the diagnosis can be made by reference to the following signs: There are present during this period the two most important subjective signs of pregnancy—namely, the menstrual suppression and nausea and vomiting. Let a given patient present these two symptoms, and the four "*soft*" *signs* of pregnancy should be looked for, and will probably be found to be present. They are the softened cervix (Goodell's sign), the softened lower uterine segment (Hegar's sign), the soft and boggy uterine body, and the softened and enlarged mammæ with the darkened areolæ. The coexistence of these signs will be strongly presumptive of an existing gestation.

In the second trimester of pregnancy—namely, the fourth, fifth, and sixth months—there will be developed, in addition to the foregoing, all the so-called positive signs of pregnancy. Thus by the beginning of the fourth month Jacquemin's sign will probably be well marked, and Braxton Hicks' sign be detected; by the middle of this month ballottement may be elicited and quickening occurs; and by the beginning of the fifth month it is possible to detect the fetal heart-sounds.

In the third trimester the fetal presentation may be ascertained by vaginal exploration, and abdominal palpation will discover the fetal outlines. These, while absolutely diagnostic, are merely confirmatory of the signs already detected in the early months of gestation. By bearing in mind these successive stages of pregnancy with their accompanying clinical manifestations the diagnosis of the condition becomes a simple matter.

(2) Probably of more importance than the foregoing is

the *differential diagnosis* of pregnancy. There are various conditions, especially in primiparæ, that closely simulate gestation, not only in the symptoms which they produce, but also in their physical signs. It often becomes a question of the most serious import to determine whether a pathologic or a physiologic process is involved in any such case. The obstetrician is not infrequently called upon to decide whether or not a pseudocyesis or an ascites, an ovarian cystoma or a uterine fibroma, a hematometra or subinvolution of the uterus, is simulating an early pregnancy, and considerable skill may be required to arrive at a positive conclusion. In the following diagnostic tables the most important points of distinction between pregnancy and these various pathologic conditions have been portrayed.

From *pseudocyesis:*

Pregnancy.	*Pseudocyesis.*
Occurs at any time during the sexual life of the woman.	Is most common in elderly women at or near the menopause, or in young hysterical women.
The usual signs of pregnancy are present.	Some of the important signs of pregnancy will be absent—*e. g.* menstruation may, and very generally does, persist, though irregularly, and the fetal heart-sounds cannot be detected.
Examination will reveal the tumor of pregnancy.	The uterus is not enlarged.
The characteristic cervix of pregnancy is present.	The cervix is unaltered.
The administration of an anesthetic has no effect upon the tumor.	The abdominal enlargement disappears during unconsciousness, and the pelvic viscera are then found to be normal, or at least not to present the alterations due to pregnancy.
Percussion generally shows dulness over the area of the enlarged uterus.	There is a tympanitic percussion-note over the whole abdominal surface.

From *ascites:*

Pregnancy.	*Ascites.*
Percussion reveals dulness in the median line of the abdomen, with coronal resonance.	Percussion shows dulness in the flanks, with resonance in the median abdominal line.
Change of the patient's position will not alter the relations of the percussion-note.	The area of dulness varies with a change in the position of the patient.
There is absence of fluctuation.	There is free fluctuation.
The signs of pregnancy are present.	The usual signs of pregnancy are absent.
The abdomen is prominent at the umbilicus (in advanced pregnancy), with flattening at the sides.	The abdomen is flattened in the umbilical region, with bulging at the sides.

Pregnancy.	*Ascites.*
The umbilicus protrudes after the sixth month.	The umbilicus is always depressed.
Palpation reveals a hard mass comprising the pregnant uterus and the fetus.	Palpation does not reveal any definite tumor.
The characteristic cervix of pregnancy is present.	The cervix is not altered.

From *ovarian cystoma:*

Pregnancy.	*Ovarian Cystoma.*
The usual signs of pregnancy are present.	There is an absence of the chief signs of pregnancy, as a general rule.
The patient is generally in good health, with an increase of body-weight; there is no characteristic facies.	In advanced cases the ovarian facies is present—a pale, drawn expression, with yellowness of the skin and general emaciation.
The abdominal tumor is hard, non-fluctuating, situated in the median line, and reveals the fetal signs.	The abdominal tumor is soft, fluctuating, showing usually more or less growth to one or the other side, and does not reveal the fetal signs.
There is generally a suppression of menstruation.	Continuance of menstruation is the rule, although it may be altered in character; suppression has been noted.
The cervix is soft (Goodell's sign).	The cervix is probably not altered.
There is a history of exposure to the possibility of impregnation, with rapidly-developing enlargement in the median line.	The history is obscure, with a slowly-developing tumor beginning on one or the other side.

Note.—These two conditions may be combined, in which case the diagnosis becomes very difficult or even impossible.

From *uterine fibroid:*

Pregnancy.	*Uterine Fibroid.*
The abdominal tumor is symmetric, soft, and elastic, and is situated in the median line.	The tumor is usually irregular, nodulated, firm, and dense, and is not uniformly situated in the median line.
Menstruation is generally suppressed.	Menstruation is generally irregular and very profuse.
The fetal heart-sounds are present.	The fetal heart-sounds are absent.
The growth of the tumor is rapid.	There is a history of slow and protracted growth extending over a period of months or years.
The characteristic cervix of pregnancy is generally to be found.	The cervix is probably not altered.

From *retained menses:*

Pregnancy.	*Uterine Distention from Retained Secretion.*
Is a very common occurrence.	Is a very rare condition.
There is the ordinary history of exposure to the possibility of impregnation.	There is commonly no history of such exposure.
Usually occurs after a normal menstrual history.	There is a history of the non-appearance of menstruation from imperforate hymen or other cause, or of suppression of menses following traumatic occlusion of the cervix, with a slowly-developing tumor, characterized by sudden periodic increases in size (*very suggestive*).

Pregnancy.	*Uterine Distention from Retained Secretions.*
There is a history of the normal duration of gestation (nine months).	The duration is much longer than that of pregnancy.
Generally the condition is unattended with pain.	The patient gives a history of periodic (monthly) attacks of pain, due to increase in the amount of the retained fluid at the menstrual epoch.
Physical examination reveals the vagina patulous, soft, and congested.	Physical exploration reveals some vaginal obstruction (imperforate hymen, atresia), with occasional distention of the vagina above the obstruction by retained secretions, as shown by rectal examination.
There are characteristic mammary changes.	There is an absence of mammary changes.

From *subinvolution* (only necessary in early pregnancy):

Pregnancy.	*Subinvolution.*
This is usually unattended with pain.	There is very commonly pain in the back or in the ovarian regions.
Palpation does not produce pain.	Pressure on the uterus elicits tenderness.
The leukorrhea is slight in amount and mucous in character.	There is a profuse mucopurulent leukorrhea, often blood-streaked.
The uterus steadily increases in size.	The uterus does not increase in size.
Other concomitant symptoms are present.	The other signs of pregnancy are absent.
Locomotion is not affected.	There may be more or less inability to walk.
There is commonly a suppression of menstruation.	There is a history of irregular menstruation, which is often profuse.

(3) Occasionally it becomes necessary to decide, for legal purposes, whether a certain woman has ever given birth to a child, and in other cases whether an existing pregnancy is the first or a subsequent gestation: a vaginal examination will promptly decide the former, and a general physical examination the latter. It is therefore essential that the distinguishing features of a virginal uterus and one that has been altered by childbearing be recognized, on the one hand, and that, on the other hand, the characteristic marks of a primiparous woman and those of a multiparous woman be borne in mind. The following will aid in determining these points:

1. *Points of Difference between a Virginal Uterus and one Altered by Childbearing.*

Virginal Uterus.	*Uterus after Parturition.*
The cavity is of normal length—about 6¼ cm. (2½ in.), and normal (triangular) in shape.	The cavity is increased in length—7⅝ cm. (3 in.) or more, and is oval in shape.
The cervix is small, hard, and cartilaginous, and of the same length as the body.	The cervix is large and soft; it is about 2½ cm. (6.98425 in.) long, while the body of the uterus measures 5 cm. (1.9685 in.) or more.

Virginal Uterus.	*Uterus after Parturition.*
The external os appears as a transverse slit or pin-hole orifice with smooth edges.	The external os is irregular and its edges are fissured.
The uterine sound shows that the sides of the cavity of the body are convex inward.	The sides of the cavity of the body are convex outward.
The uterus is normally anteflexed.	The axis of the uterus is apt to be straighter, or the uterus may even be retrodisplaced.
There is more or less flattening of the anterior and posterior uterine surfaces.	The contour of the body of the uterus is more rounded, while its diameters are increased.
The fundus is nearly flat.	The fundus is convex.
The internal os is closed.	The internal os is partially patulous.

2. *The Characteristic Marks of a Primiparous and a Multiparous Woman.*

Primipara.	*Multipara.*
The fourchet is present.	The fourchet is missing.
The perineum is tense and deep.	The perineum is relaxed and probably torn.
The labia are in apposition.	The vulva is frequently patulous.
The vagina possesses tonicity, and is rough and rugous, with a granular feel.	The vagina is relaxed and smooth.
The cervix is long, soft, and conical; the os is undilated.	The cervix is large, cylindric, short, not so soft, and probably lacerated; the os is patulous.
The abdomen is full, rounded, tense, and resisting to the touch.	The abdominal walls are relaxed and non-resisting to the touch; the skin is loose and wrinkled.
Dark, purplish-red striæ appear late in pregnancy.	The striæ may be both white and livid, the former being present from the beginning of pregnancy.
The breasts are full, firm, and sensitive to pressure.	The breasts are flabby, pendulous, and non-sensitive to pressure.
The nipples are usually small and undeveloped or even inverted.	The nipples are large and well developed.
Striæ are absent upon the breast.	Striæ are frequently to be found.

The Hygiene and Management of Pregnancy.

The great majority of women during the progress of gestation will at some period suffer from one or another of the many affections consequent upon their delicate condition. Any trivial indiscretion during this period will result in disturbances of the equilibrium of the body, manifesting themselves, for example, in an exaggeration of the physiologic vomiting or an aggravation of the preexisting constipation, or, perchance, in an acute attack of diarrhea. Some precautionary rules must, therefore, be observed by every pregnant woman in order to preserve the normal habit of the body and to avoid the effects of external agen-

cies the influence of which under ordinary circumstances would not be appreciated.

Diet.—This should be nutritious and at the same time plain and easily digestible. Usually the appetite is good, and care should be taken that digestive disorders do not follow excesses or the over-ingestion of partially indigestible materials. The natural tendency to constipation may be counterbalanced by the moderate use of laxative foods. A dietary may be selected from the appended list according to the needs or inclination of the patient.

Suitable Dietary.—Vegetables: Potatoes (baked); green peas; asparagus; green corn; macaroni; spinach; celery: lettuce; greens and cresses. *Meats:* Beef; mutton; ham; chicken; game; sweetbreads; eggs; butter; various meat-soups (chicken, oyster, clam, mutton); fish and shellfish as desired. *Bread-stuffs:* Oatmeal; rice; wheaten grits; corn bread; wheat bread, one day old. *Beverages:* Plenty of water; milk; tea or coffee; cocoa (in moderation). *Desserts:* Only those that are plain. *To be Avoided:* Veal; pork; rich desserts; pastries; hashes; stews; rich gravies; fancy and made dishes.

Clothing.—The garments should be loose; corsets, stays, and belts should be discarded, in order that respiration may be unimpeded. In cold weather flannel drawers are serviceable. When the abdominal walls are relaxed a closely-fitting abdominal belt may be worn with much comfort to the patient.

Exercise.—A portion of each day should be spent in the open air, and moderate exercise should be indulged in. Horseback riding, the lifting of heavy weights, running up stairs, driving over rough roads, and other violent forms of exercise must be strictly avoided, lest miscarriage result. Anything that tends to excite may result disastrously, therefore mental disturbances are hazardous. There should be a regular hour for retiring, and the patient should lie down for a short period each day.

Sexual Intercourse.—The marital relation should cease as soon as it becomes certain that gestation has begun. One of the most fruitful sources of abortion and of systemic disturbance (as, for example, exaggerated vomiting), especially in young married women, is over-indulgence in the sexual act. All the rules of hygiene would preclude sexual intercourse under these circumstances.

Bathing and Douching.—It is very essential that the eliminative functions of the woman be kept in excellent working order. Lukewarm baths, neither too hot nor too cold, will stimulate the action of the skin, and will to a considerable extent relieve the overworked kidneys. Vaginal douches taken with due precaution and in not too large amount will remove the excess of leukorrheal discharge and contribute to the comfort of the woman. Care must be taken, however, that the fluid does not strike against the cervix with any force; it should flow in gently, and immediately be allowed to drain away.

The Kidneys.—The renal action must be carefully watched from the beginning of gestation. After the sixth month, during which time renal insufficiency is most prone to develop, the urine should be examined every ten days or two weeks. Should albuminuria appear, the diet must at once be regulated and made to consist largely of milk. Exposure to cold and wet must be guarded against, and anything that will throw additional strain upon the kidneys avoided.

Constipation.—A sluggish action of the bowels is normal, but when it becomes excessive measures must be adopted to overcome it. Proper diet will largely do this, but in case of failure by this means, various remedies may be tried. A saturated solution of magnesium sulphate, 2 drams every two or three hours; Hunyadi water; compound licorice powder; one or two Lady Webster pills; a Seidlitz powder; or tablets of aloin, belladonna, and strychnin ($\frac{1}{60}$ grain), with or without ½ grain of the ex-

tract of cascara sagrada, one tablet to be taken at bedtime, will generally suffice to maintain a proper peristaltic action. Regulation of the bowels will do much toward securing continued normal action of the kidneys.

Mental Occupation.—The psychical alterations so common in pregnancy may be largely overcome by proper attention to the foregoing precepts. In addition, it is well to provide a certain amount of mental recreation in the form of light entertainment, books, and moderate indulgence in social duties. Too often women, especially in their first pregnancies, seclude themselves too rigidly, with necessarily an aggravation of the mental phenomena peculiar to their condition. Proper attention to these hygienic precautions should be enforced. Unpleasant and painful scenes or impressions should be avoided, that the possibility of the production of some of the so-called maternal impressions may be prevented.

The Mammary Glands.—Proper development of the nipples should be favored by judicious manipulation for a minute or two each day in late pregnancy; it should be remembered, however, that there is an intimate relationship existing between the breasts and the genitalia, and undue irritation of the former may result in uterine contraction and the induction of abortion. Perfect cleanliness of the nipples by means of a weak solution of sodium borate (half an ounce of the salt to the pint of water) should be insisted upon; if they are painful, they may be anointed at night with a little cocoa-butter or lanolin.

VI. EUTOCIA, OR NORMAL LABOR.

At the expiration of the full period of pregnancy the woman falls into labor. This is said to be *labor at term;* any termination of gestation prior to this date is designated an *abortion*, *miscarriage*, or *premature labor*, according to

the time of its occurrence, whether in the first, second, or third trimester.

The Duration of Pregnancy.—This is a question incapable of accurate determination, as must be evident from the absolute uncertainty attendant upon the date of conception. If in every instance the time of the fruitful coition, or rather of the meeting of the ovum and the spermatozoid, could be ascertained, a basis could be had from which to calculate the probable date of confinement. As this accuracy is, as a rule, impossible in any given case, an approximate idea only can be obtained, and by taking the average of a number of such approximations an estimation of the normal duration of pregnancy can be made. From a number of investigations made in this manner by eminent obstetricians the world over it has been found that in the human being pregnancy carried to term covers a period of 278 or 280 days, or ten lunar or nine calendar months (forty weeks). It very frequently happens that labor anticipates by a few days, while more rarely it may be prolonged for some days or weeks. Especially is this tendency to a prolongation of the duration of pregnancy noted in elderly primiparæ, in whom the tissues are less sensitive and more rigid. In some instances, but very rarely, as many as three or even four weeks have elapsed beyond the normal term before the onset of labor-pains.

Methods of Determining the Date of Confinement.—It is essential to determine, as soon as practicable, the probable date of confinement. Various rules have been suggested, some of the most reliable of which are as follows:

1. *The Naegele Rule.*—The date of the appearance of the last menstruation should be ascertained; from this date there should be counted back three months, and to the result seven days should be added. This gives very closely the probable date of confinement.

2. *Duncan's (Matthews) Rule.*—The closing day of the last menstruation having been determined, that day nine months

forward must be reckoned as 275 days, unless February be included, in which case it is to be reckoned as but 273 days; to this date three days must be added in the former case or five in the latter in order to make 278 days. This 278th day should be considered as the middle of the fortnight in which confinement is likely to occur.

3. *Löwenhardt's Method.*—The number of days between the last menstrual period and the one immediately preceding it must be ascertained; ten times this number will give the space of ten menstrual periods, or about ten lunar months. This is even more accurate than Naegele's rule.

4. *The Date of Quickening.*—When the menstrual history cannot accurately be obtained, it may be that the date upon which quickening was felt may be remembered. As this usually occurs at about four and a half months after conception, by adding four and a half months to this date an approximate idea may be obtained as to the time of confinement. This method is largely used by the laity, especially if pregnancy occur during lactation.

5. *Mensuration of the Uterus.*—(*a*) *Estimation of the Height of the Fundus.*—A physical examination of the woman's abdomen will give an approximate idea as to the stage to which pregnancy has advanced (see *Uterine Signs of Pregnancy*, page 79). (*b*) *Spiegelberg's Method.*—Owing to the variation in the position of the umbilicus, which rendered inaccurate the observations based upon this factor, Spiegelberg took an average of measurements of the uterus above the symphysis in the successive weeks of pregnancy. His results, which are probably a little above the normal, are embraced within the following table:

From 22d to 26th week the fundus of the uterus is				21¾ cm. (8.5629 in.)	above the symphysis.	
At the 28th week	"	"	"	26½ cm. (10.4330 in.)	"	"
" 30th week	"	"	"	28 cm. (11.0236 in.)	"	"
" 32d to 33d week	"	"	"	30 cm. (11.8110 in.)	"	"
" 34th week	"	"	"	30½ cm. (12.0078 in.)	"	"
" 35th to 36th week	"	"	"	31¾ cm. (12.5 in.)	"	"
" 37th to 38th week	"	"	"	33 cm. (12.9921 in.)	"	"
" 39th to 40th week	"	"	"	34 cm. (13.3858 in.)	"	"

6. *Fetal Mensuration.—Ahlfeld's Method.*—Under certain circumstances—for instance, in varying degrees of pelvic contraction—the size of the fetus at the successive weeks of pregnancy becomes an important point to determine. After devoting much time and considerable study to this matter, Ahlfeld has formulated the following law: The long axis of the fetus lying flexed in the uterus (the fetal ellipse) is nearly half the entire length of the fetus when extended. The long axis of the fetal ellipse may be approximately determined by placing one arm of a pelvimeter in the vagina against the fetal presentation, while the remaining arm rests on the extremity of the fetal ellipse in the uterine fundus. On doubling this measurement the approximate length of the fetus at the given period of pregnancy will be obtained. In the following table are given the measurements and weights of the fetus at varying periods in the latter half of pregnancy, as determined by this method:

	Axis of Fetal Ellipse.	*Length of Fetus.*	*Weight.*
At the 25th week,	17½ cm. (6.88975 in.),	35 cm. (13.7795 in.),	1213 grams (39 oz.).
" 28th "	20 cm. (7.8740 in.),	40 cm. (15.7480 in.),	3½ pounds.
" 30th "	20⅝ cm. (8.12006 in.),	41¼ cm. (16.240125 in.),	4¼ pounds.
" 33d "	21¼ cm. (8.366125 in.),	42½ cm. (16.73225 in.),	4½ pounds.
" 34th "	21⅞ cm. (8.6121875 in.),	43¾ cm. (17.224375 in.),	5½ pounds.
" 35th "	22¼ cm. (8.759825 in.),	44½ cm. (17.51965 in.),	6 pounds.
" 36th "	23⅞ cm. (9.3975875 in.),	47¾ cm. (18.799175 in.),	6¼ pounds.
" 38th "	24½ cm. (9.64565 in.),	49 cm. (19.2913 in.),	6½ pounds.
" 40th "	25 cm. (9.8425 in.),	50 cm. (19.6850 in.),	6¾-7½ pounds.

7. *The Use of Periodoscopes and Tables.*—Various tables and schemes have been devised for this purpose, all of which are based upon the date of the last menstruation. Some of the most important of these, with the method of using them, are appended.

Smith's Ready Reckoner.—This is a table composed of two columns, the first containing the duration of pregnancy estimated from the first of any month to the expiration of gestation at the end of nine *calendar* months, while the second column gives the date of expiration of full term at the end of ten *lunar* months (see page 114).

TABLE FOR CALCULATING THE DATE OF CONFINEMENT.

Jan.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Oct.	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	Nov.
Feb.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28				
Nov.	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5				Dec.
Mar.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Dec.	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	Jan.
April.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Jan.	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4		Feb.
May.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Feb.	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3	4	5	6	7	Mar.
June.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Mar.	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6		April.
July.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
April.	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	May.
Aug.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
May.	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	June.
Sept.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
June.	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7		July.
Oct.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
July.	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	Aug.
Nov.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Aug.	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6		Sept.
Dec.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Sept.	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	Oct.

Supposing the upper figure in each pair of horizontal lines to represent the first day of the last menstrual period, the figure beneath it, with the month designated in the margin, will show the probable date of confinement.

Nine Calendar Months.			Ten Lunar Months.	
From	To	Days.	To	Days.
January 1	September 30	273	October 7	280
February 1	October 31	273	November 7	280
March 1	November 30	275	December 5	280
April 1	December 31	275	January 5	280
May 1	January 31	276	February 4	280
June 1	February 28	273	March 7	280
July 1	March 31	274	April 6	280
August 1	April 30	273	May 7	280
September 1	May 31	273	June 7	280
October 1	June 30	273	July 7	280
November 1	July 31	273	August 7	280
December 1	August 31	274	September 6	280

In order to estimate the duration of a pregnancy beginning on any given day between the first and last of any given month, all that is necessary is to add to the date corresponding to the termination of a pregnancy beginning on the first of the month in which menstruation ceased a number of days corresponding to the date of cessation of

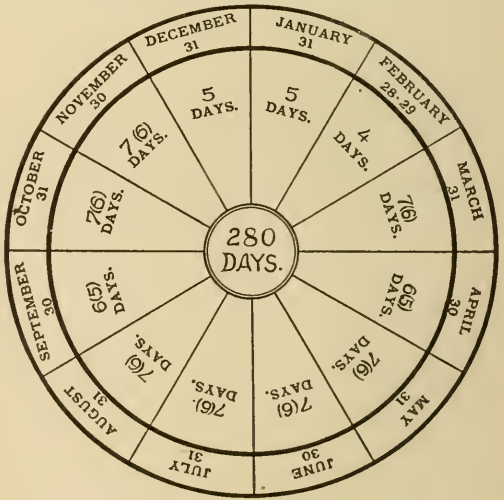


Fig. 50.—Schultze's circle.

menstruation. Thus, a woman ceased to menstruate on April 17; she will be confined at some time between January 17 and 22, which dates are obtained by adding seven-

teen days to the dates of termination of pregnancy as given in the table—namely, December 31 and January 5.

Schultze's Circle (Fig. 50).—In order to estimate the date of confinement, count back according to Naegele's method, and add to the date thus obtained the number of days indicated within the section under the month designated, thus making 280 days. In leap-years the figure within the brackets is to be added.

Labor.

Labor is that natural process by which a pregnant woman expels the product of conception at the full expiration of the period of pregnancy, 280 days after conception.

Causes of Normal Labor.—Although it is not exactly known why normal labor should occur when it does, there are certain predisposing factors that may have a bearing upon it. None of them are entirely satisfactory in their explanation of the phenomenon, and it may be that there is no one absolute determining cause, but that the combined action of all of these factors exerted at the proper time is necessary, in conjunction with some slight exciting cause, to precipitate the onset of the labor-pains. Some of the views that have been advanced are incapable of substantiation, although eminently rational in their suggestion.

The *determining or predisposing causes* of labor may be grouped as follows: (1) *Heredity.*—It is probable that the habit of womankind, contracted through numberless generations, of falling into labor at the expiration of ten lunar months is a very powerful determining factor in the production of labor. With this strong tendency existing any trivial exciting cause will suffice to initiate the process. (2) *Periodicity.—Smith's* (*Tyler*) *Theory.*—This view of the causation of labor claims that at the regular monthly periods an ovarian congestion is present, and that this becomes extremely pronounced at the tenth menstrual epoch following concep-

tion, resulting in the precipitation of labor-pains. Associated with this is an increased uterine irritability at these epochs, rendering the uterus more susceptible to the influence of external agencies. (3) *Reflex Contraction from Overdistention of the Uterus.*—This is evidently a false view, for in certain pathologic conditions—*e. g.* hydramnios—there occurs extreme distention of the uterus without the production of uterine pains. (4) *Fatty Degeneration of the Decidua.*—*Simpson's Theory.*—Fatty changes undoubtedly take place in the tissues of the decidua toward the end of pregnancy, and Simpson claimed that these changes favor a separation of the mature product of conception from its uterine attachment, it then becoming a foreign body and exciting uterine contraction. (5) *Fatty Degeneration of the Placenta.*—Corresponding changes also take place in the placenta associated with the formation of peculiar polynucleated giant-cells, and, according to this view, from these changes there results an accumulation of carbonic-acid gas in the uterine sinuses; the uterus is thus stimulated to contract. (6) *Pohlman's Theory.*—A very ingenious and rational theory, somewhat resembling Simpson's theory, but not taking into consideration any degenerative tissue-metamorphosis, has recently been suggested to me by Professor Pohlman of the Buffalo University. He believes that so long as the fetus is in the process of development it constitutes in effect, if not in reality, a portion of the mother's organism, but as soon as full maturity is reached the fetus becomes a foreign body, and as such is extruded from the body by means of uterine contractions, as all foreign bodies, wherever they may be located, are cast off by nature.

The *exciting* or *efficient* causes of labor are any slight exertion over the normal—excessive exercise, mental excitement, the use of a cathartic, slight trauma, as a fall or a jar, the jolting of a carriage, or other similar trivial agency. These, acting upon the preexisting determining causes, result in a stimulation of the uterine muscles to contract.

Phenomena of Normal Labor.—The onset of labor is manifested by certain clinical phenomena that are unmistakable. When these are present the speedy expulsion of the product of conception may be anticipated. These phenomena of labor are as follows: (1) *Lightening, Subsidence of the Uterus, or the so-called "Falling of the Womb."*—At a variable period before labor—ten days or two weeks in multiparæ and three or four weeks in primiparæ—there is a subjective premonitory sign of labor. The woman finds that she is able to breathe with greater ease, and she has a sense of lightness and decrease in the amount of abdominal distention. This sensation is produced by a descent of the uterus into the pelvic cavity, with accommodation of the size and shape of the fetal head to the pelvic inlet—the first step in the mechanism of labor; this occurs sooner in primiparæ on account of the greater irritability of the uterine muscles and their consequent resentment of over-distention. The relief of the dyspnea of pregnancy is, however, generally accompanied by an aggravation of the pressure-symptoms. The bladder immediately becomes more irritable than before, and frequent micturition is the rule, together with increased constipation, the formation of hemorrhoids, excessive leukorrhea, and edema of the vulva and extremities. Failure of lightening to occur is frequently indicative of some obstetric complication, such as a degree of contracted pelvis, the presence of a neoplasm, or some fetal malposition, and as such must be regarded with considerable apprehension.

(2) *The "Pains," or Uterine Contractions.*—These are involuntary and painful contractions of the uterine muscles occurring intermittently and with increasing severity. They are, in reality, an exaggeration of the rhythmic uterine contractions that have occurred throughout the last months of pregnancy (Braxton Hicks' sign). *Time of the Commencement of Labor.*—In the vast majority of cases the initial pain occurs during the first half of the night, generally between

ten and twelve o'clock. This is a curious fact that has as yet evaded explanation. *Their Course.*—Opinions vary as to the starting-point of the pains, whether at the fundus or in the cervix, but from a resumé of the views advanced the consensus of belief seems to favor the fundal origin. The pains may follow one of two courses: (*a*) Usually they are first felt over the small of the back, and from this point pass around the abdomen and even at times down the thighs; (*b*) They may reverse this direction, and, commencing at the umbilicus, pass backward to the sacrum. They are cumulative in nature, beginning as a slight colicky pain, and increasing in intensity until they assume the proportions of a severe cramp, after which they slowly die away. They are not all of equal intensity, the first pains being slight, but the others progressively becoming more severe and more effective until the birth of the child is accomplished. Their frequency also varies: at first they may occur but once in a half or three-quarters of an hour; as labor advances and the os dilates they occur with increasing frequency, and toward the close of labor there may be a pain every one and a half to two minutes. The duration of each pain is from a half to one minute. Mental emotion of any kind will temporarily diminish their intensity or even absolutely suppress them; the entrance of the physician into the lying-in room may have the same effect. The object of the pains is to forcibly drive the liquor amnii against the cervical tissues, and by means of the hydraulic pressure thus exerted to secure ultimate dilatation of the os. Their character varies in the different stages of labor. At first acute, colicky, and cramp-like, after thorough dilatation of the os has been accomplished they acquire a "bearing-down" quality, and then become effective in expelling the fetus. Not all women suffer alike during the process of parturition, the amount of suffering being influenced largely by the nervous development of the patient. The pains are more likely to be severe in primiparæ who are very young or who are advanced in years. The intermittent quality is

nature's provision to prevent maternal exhaustion and fetal death: were it not for this interval of relaxation, not even the strongest woman could survive the anguish of parturition, and every fetus would be destroyed by asphyxiation from interference with the placental circulation or from cerebral compression. *Effects of the Pains.*—Under the influence of a pain the uterine muscle becomes hard and rigid, and in shape the uterus is altered from an ovoid to a globular body (Figs. 51, 52); the area of the intrauterine

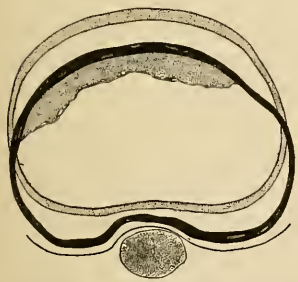


FIG. 51.—Diagram illustrating the alteration in the shape of a cross-section of a uterus during its contractions. The heavy line represents the non-contracted, the dotted line the contracted, uterus (compare Fig. 52).

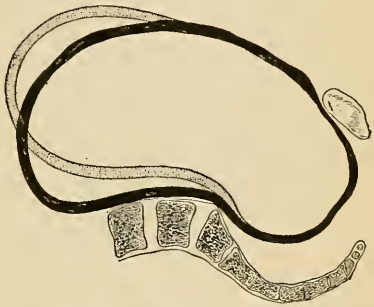


FIG. 52.—Diagram illustrating the alteration in the shape of a sagittal section of the uterus during its contractions. The heavy line represents the non-contracted, the dotted line the contracted, uterus.

space is also diminished and the contents are driven toward the expanding os. There is a marked rise in the arterial tension of the mother's blood-vessels and an acceleration of the pulse-rate, the beats falling again to the normal as the uterus relaxes. The uterine souffle becomes more distinct; there is a slight elevation of the body-temperature, and a slowing of the respiration during, with rapid respiration between, the pains. There is also a slowing of the fetal heart. *Cause of the Pains.*—In the early stages of labor it is probable that the suffering results, in part, from compression of the terminal nerve-filaments of the uterus by the contracting muscular fibers. Werth suggests that to this is added

a spinal neuralgia from anemia of the lower portion of the cord and its meninges. In the late stages of labor the pain is increased by pressure on the pelvic nerve-plexuses by the enlarged uterus, and upon the vaginal nerves by the descending fetal presentation, and also by cramp-like contractions of the abdominal muscles.

False or Premonitory Pains (*Dolores Presagientes*).—These are peculiar painless or slightly, and at times decidedly, painful irregular uterine contractions occurring shortly before the advent of labor, and not resulting in the dilatation of the os nor in the production of the "show." They are most common in multiparæ, and occur usually in the first hours of the night. *Location.*—They are most frequently felt in the fore part of the abdomen, and result as a rule from constipation.

(3) *The "Show."*—This is a discharge of a small amount of blood-stained, stringy mucus characteristic of progressing labor. The plug of mucus has persisted in the cervical canal throughout the latter months of pregnancy, and as the os dilates it is loosened and finds its way into the vagina; it is tinged by the blood coming from the lacerated cervical vessels.

(4) *Dilatation of the Os, with Effacement of the Cervical Canal.*—This may be regarded as the most important of the signs of beginning labor, although simple dilatation without effacement is not absolutely incompatible with a continuation of pregnancy. Cases are on record in which dilatation to the extent of an inch or more has been noted, followed by a partial retraction and the postponement of labor for several days or weeks.

Stages of Normal Labor.—For convenience of description labor has been divided into three stages—namely, the stage of dilatation and effacement, the stage of expulsion, and the placental stage or stage of the after-birth.

(1) *The Stage of Dilatation and Effacement.*—This covers the period from the first true pain until full dilatation of

the os has been accomplished; its average *duration* is, in primiparæ, ten or twelve hours, and in multiparæ six or eight hours. The pains during this stage are involuntary; they are acute and cramp-like, and gradually increase in severity, frequency, and duration. The character of the cry produced is rather that of a high-pitched whine, and is not modified by voluntary expulsive efforts. There is but a slight degree of exhaustion attendant upon this stage, and what little there is results largely from interference with sleep and rest. *Vaginal examination* reveals a patulous condition of the external os, through which the protruding bag of waters (Fig. 53) may be felt as an elastic membrane; as the labor progresses the os becomes more dilated and the cervix thinner, until finally the latter feels like a ring of tissue-paper, which becomes hard and rigid during a pain. The fetal presentation may be distinguished through the lax membranes in the intervals between the pains, but during a pain the liquor amnii is driven downward and the membranes bulge, giving the feel of a tense cushion. With the progressive dilatation reflex nausea and vomiting are very commonly present, and occasionally an uncontrollable nervous shivering is noted. As a rule, rupture of the membranes does not occur until toward the close of this stage; in exceptional cases, however, the liquor amnii may be discharged almost with the first pain, and in this case the delivery, which is generally

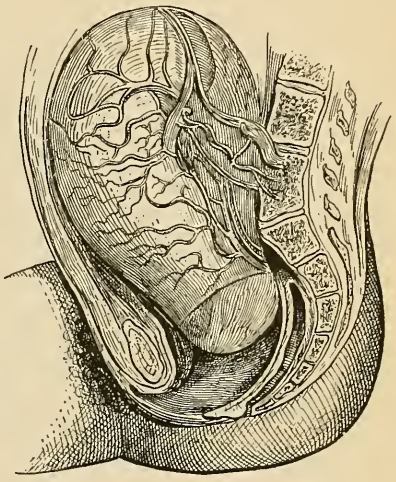


FIG. 53.—The bag of waters.

much protracted, is termed a "*dry labor.*" In other and still rarer cases rupture may be delayed until after the birth of the fetus, when the child is said to be born with a *caul.* Some cases are even recorded in which there has been the delivery of the entire product of conception, placenta, membranes, and fetus, without escape of the liquor amnii; when this occurs it is usually an accompaniment of premature and precipitate labor with an undersize of the fetus. Such a case occurred during the writer's term of service as resident physician in the Philadelphia Hospital, the patient being a syphilitic primipara in labor at six and one-half months. Dr. Joseph Forman[1] has reported the expulsion of a complete ovum at the seventh month, the membranes intact and the child living. The patient was a duipara suffering with pleuropneumonia. Such an occurrence may be the result of a short cord, as when the funis encircles the neck or other portion of the fetal body, or it may be due to a premature fatty degeneration of the placental attachment, to extreme tenacity of the membranes, or to undue laxity or over-size of the parturient canal. There is usually a temporary diminution in the severity of the pains immediately after rupture occurs. The *posture* to be assumed by the patient during this stage of labor is usually left to her own volition. She should be permitted to stand erect, walk around the room, or sit down as she chooses and on no account should she endeavor to assist the labor-pains; such efforts are valueless and exhausting.

(2) *The Stage of Expulsion.*—This stage covers the period from the time of full dilatation of the os until the birth of the child; its average *duration* is, in primiparæ, two or three hours, and in multiparæ from one to two hours. The pains now are completely altered in character; they are much more intense, have assumed a bearing-down quality, and are associated with voluntary efforts on the part of the patient, the abdominal muscles and the diaphragm being

[1] *Jour. de Méd. de Paris*, April 9, 1895.

brought into play. As the pain comes on the woman takes a long breath, grasps whatever object may be within reach, and strains as in difficult defecation. This is often accompanied by a grunting sound as a quick inspiration is taken and the bearing-down efforts are renewed. The effect

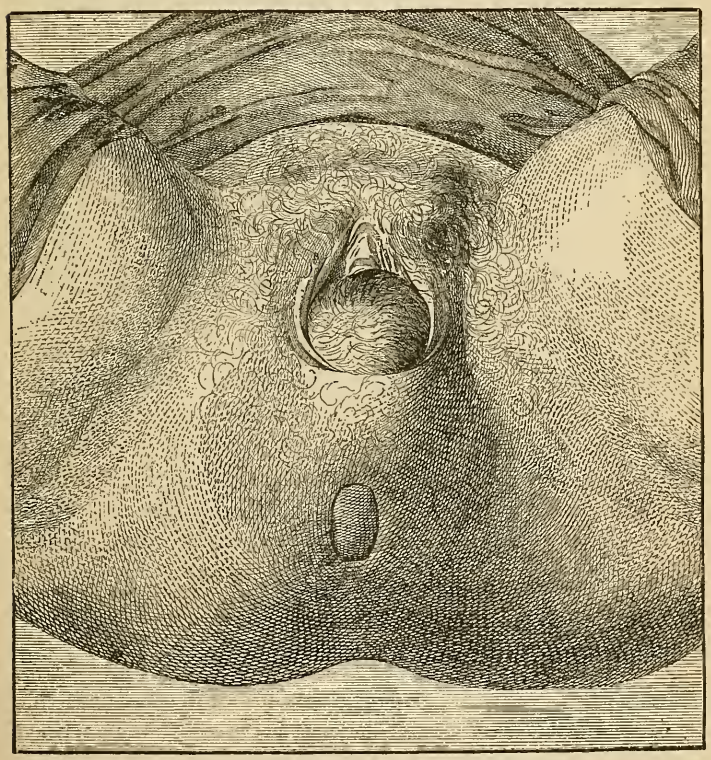


FIG. 54.—Bulging of the perineum.

of the pains is very apparent. Passing through the fully-dilated cervix, with each pain the presenting part is driven down the vagina, which dilates to receive it. Finally the pelvic floor is reached, and the firm but elastic perineal structures direct the advancing part upward and forward

toward the vulvar orifice. The passage through the vagina is facilitated by a profuse secretion of glairy mucus that thoroughly anoints the presenting part and the vaginal tract. In the intervals between the pains the resisting soft structures press back the fetus, so that there is a marked recession until the head becomes too firmly fixed under the symphysis pubis for this phenomenon to occur. The perineun now bulges during the pains (Fig. 54); the anus opens and the bowel protrudes; the vulvar orifice dilates, and the presenting part may be seen as the woman bears down, again disappearing as the pain dies away. This alternate advancement and recession gradually distends the perineum and prevents laceration, which otherwise would inevitably occur in every case. During this process the woman complains of an irresistible desire to micturate and defecate, due to the pressure upon the bladder and rectum exerted by the advancing fetus, and frequently there is an escape of both urine and feces. Finally, under the impulse of one supreme effort, the presenting part emerges from beneath the symphysis, the thinned perineum retracting below. With the birth of the head the fundus uteri rapidly sinks, the uterine walls and the fetal body remaining in close apposition. Much has been written of the physiologic cry that accompanies the birth of the first portion of the fetus. It has been said that as the woman shrieks all volition is removed and the uterine contractions alone accomplish the delivery of the child, thus to a large degree preventing perineal lacerations. This is true as far as it goes, and were it inevitably the case that the woman emitted a shriek just as the fetus was born, doubtless numerous perinei would escape extensive injury. In point of fact, however, in many instances there is no outcry whatever, the fetus being driven irresistibly onward through the vulvar orifice, while the patient strains in her expulsive efforts with clenched hands and closed mouth and firmly-contracted abdominal muscles. The effect thus produced is tremendous, and extensive laceration seems

inevitable. In such cases it is only by stern commands to the patient to cease her bearing-down efforts and to open her mouth that the voluntary force can be abolished and the perineum protected. Immediately succeeding the birth of the head there is again a temporary cessation of the pains, which, however, soon return, and the entire body is expelled together with a gush of blood-stained liquor amnii, thus terminating the second stage of labor.

The *posture* occupied by the woman during these successive changes varies. In every instance she should be confined to the bed as soon as cervical dilatation is completed. In the early portion of this second stage of labor, if left to herself, she will toss from side to side, and finally, as the head descends, will almost invariably turn upon her back with the thighs drawn up and the legs flexed, and while she is in this position the child will be born. It has been found, however, that labor may be facilitated by superintending the movements of the patient. Thus, in the first half of the expulsive stage the semi-recumbent position is the best, with the feet well supported and the hands grasping a puller fastened to the foot of the bed. In this way the pelvic obliquity is lessened and the voluntary forces may be best employed. As the head descends the position must be changed. The patient should then turn upon that side toward which the fetal back presents—generally the left—in order to secure perfect flexion of the head, and, still maintaining the squatting position of the body, she should continue her traction upon the puller during the uterine contractions, ceasing her voluntary efforts, however, when commanded to do so.

(3) *The Placental Stage, or Stage of the After-birth.*—This stage covers the period from the birth of the child until the delivery of the *secundines* (placenta and membranes); its average *duration* is, in primiparæ, fifteen or twenty minutes, and in multiparæ from five to fifteen minutes. Immediately following the delivery of the child there succeeds a short

period of calm and restfulness. The patient lies quietly or expresses her satisfaction at the termination of her sufferings. In some cases there is a feeling of faintness due to the sudden emptying of the uterus; in others there may supervene a sensation of chilliness, or an absolute rigor may occur, the patient shaking violently and her teeth chattering. This, the *postpartum chill*, as it is termed, is purely nervous in origin, and is by no means indicative of a beginning pathologic process. An examination of the abdomen at this time will reveal a hard and knotted condition of the uterus, which organ will extend upward to a point a little above the umbilicus. Palpation is productive of pain, and the patient will bitterly resent any abdominal manipulation. Auscultation of the abdominal surface immediately over the uterine tumor may at this time elicit *Caillant's sign*, which may be mentioned here not as being of any diagnostic value, but merely as of interest in the study of labor. It consists in a peculiar scratching sound heard after the birth of the child, during the process of delivery of the placenta, and is believed to be produced by the tearing away of the placenta from the tissues of the uterine wall. It cannot always be detected. The finger in the vagina may follow the cord upward to the mouth of the uterus, which is now considerably contracted, and just above, as a rule, the placenta may be felt resting apparently within the lower uterine segment. In the space of a few minutes—from ten to twenty—there is a return of the labor-pains, though to a greatly diminished degree, and the placenta and attached membranes will be protruded from the vulvar orifice together with gushes of liquid and clotted blood. The uterus rapidly contracts upon the advancing secundines and postpartum hemorrhage is prevented. During this process the cord may be held taut, without, however, any traction being made. The expulsion by the uterine contraction is aided by the voluntary contraction of the abdominal and perineal muscles. The *posture* of the woman during and imme-

diately following this stage should be the flat dorsal, with the limbs flexed and the head low.

Duration of Normal Labor.—This is dependent upon various determining factors, most essential of which is the number of the pregnancy. It has been found that in primiparæ the average duration of labor is from twelve to fifteen hours, and in multiparæ from eight to ten hours. The age of the patient also influences the duration, and an elderly primipara will usually have a protracted or tedious labor. The change produced in the physical constitution of the woman by her environment and mode of living will exert a very powerful influence upon her ease of procreating. Thus, as a rule, labor is more tedious and difficult among civilized people than among savages. Indeed, painless parturition is said to be the rule among the barbarous and semi-barbarous nations. The time at which the majority of births take place is during the latter half of the night.

Mechanism of Normal Labor.—By the mechanism of labor is meant the manner in which the fetus and secundines pass through the parturient canal and are expelled. This subject comprises the recognition of the part of the fetus that is presenting, the position it holds, and the mechanical forces by which it is expelled from the uterus and is caused to pass through the vagina and vulva. These points may be determined by palpation of the abdomen and by vaginal examination.

By the *presentation* is meant that portion of the fetal body which is detected by the examining finger introduced to the center of the plane of the superior strait of the maternal pelvis. The possible varieties of presentations are—1. Cephalic, or Head, including (*a*) Vertex, (*b*) Face, (*c*) Bregma or Anterior Fontanel, (*d*) Brow, (*e*) Ear, (*f*) Parietal Eminence; 2. Pelvic, including (*a*) Breech or Coccygeal, (*b*) Knee, (*c*) Foot or Footling; 3. Transverse or Trunk, including presentation of the abdomen, arm, shoulder, back, breast, neck, and side. Of these varieties but

two may be regarded as normal presentations—namely, those of the vertex and the pelvic varieties. These alone will be considered under the normal mechanism of labor, the others being treated among the causes of dystocia.

The term *position* has a twofold signification in the subject of the mechanism of labor. As generally accepted it means the varying relationship borne by the most prominent point of the presenting part of the fetus to the cardinal points of Capuron. According to the position occupied by the presenting part will be determined in any case the possibility or impossibility of a normal mechanism. The term *position* may also indicate the relationship existing between the long axis of the fetus and that of the uterus. Thus, a fetus may occupy a longitudinal or a transverse position in the uterine cavity according as to whether its long axis corresponds with or is at right angles to the long axis of the uterus. The most common position of the fetus with reference to the uterus is the longitudinal, about 99½ per cent. of all fetuses holding this position; it includes all of the cephalic and pelvic presentations. Of the two varieties of longitudinal presentations, the cephalic is by far the more frequent, it occurring in about 95½ per cent. of all cases, and for very obvious reasons. These are as follows: 1. Because of the peculiar shapes of the uterus and of the fetal ellipse; 2. Because it is most conducive to the comfort of the fetus and to the furtherance of its growth and development; 3. Because of the situation of the fetal center of gravity, which lies near the head.

In order to comprehend the first of these causes of cephalic presentation it will be necessary to refer for a moment to the shape of the uterus and that of the fetus. By the term *fetal ellipse*, so designated because of its peculiar elliptic shape (Fig. 55), is meant the attitude of the full-term child *in utero*. There is an arching forward of the body, with flexion of the head upon the chest and of the thighs upon the pelvis; the arms are closely pressed

against the thoracic walls, and the forearms are flexed upon the arms and crossed upon the chest; the legs are flexed upon the thighs; the feet are laterally inverted with the toes turned in, and are crossed upon each other. The pelvic portion of the fetal ellipse is larger than the cephalic, and therefore finds more room in the upper and larger portion of the pear-shaped uterus, while the head is better adapted to the smaller lower uterine segment. *Pajot's law of accommodation* admirably expresses this most probable mechanical reason for the frequency of head presentations of the fetus. It has been thus worded: "When one solid body is contained in another, and if the latter be alternately in a state of motion and of repose, and if the surfaces are rounded and smooth, the included body constantly tends to accommodate its shape and dimensions to the shape and capacity of the containing body."

FIG. 55.—Diagram showing fetal ellipse; also the head lever (Dickinson).

In the appended table[1] (pages 130, 131) will be found a grouping of the various fetal positions and presentations, with their respective points of diagnosis.

The *vertex* is the most common of the cephalic presentations. This results from the mechanical relationship existing between the axis of the spinal column and the axis of the fetal head. As may be seen by reference to Figure 55, the vertebral axis does not bisect the cephalic axis at its middle point, but at a point nearer the posterior portion of the head. Now, the force exerted equally upon all portions of the fetal head will result in greater flexion of the longer bar, according to a well-known rule of physics,

[1] Prepared originally by the writer for *Gould's Dictionary*, and altered therefrom.

Table of the Positions and Presentations of the Fetus.

Presentation.	Frequency.	Varieties.	Symbol.	Frequency of Varieties.	Position of Fetus.	Position of Fetal Heart-sounds.	Mortality.	
							Fetal.	Maternal.
Vertex.	95 per cent. of all cases.	Left occipito-anterior.	L.O.A.	70 per cent.	Occiput to left acetabulum, forehead to right sacro-iliac joint; back to left; extremities to right, above; sagittal suture in right oblique diameter; shoulders in left oblique diameter, the right anterior.	One inch below and to left of umbilicus.	5 per cent.	Less than 1 per cent.
		Right occipito-anterior.	R.O.A.	10 per cent.	Occiput to right acetabulum, forehead to left sacro-iliac joint; back to right; extremities to left, above; sagittal suture in left oblique diameter; shoulders in right oblique diameter, the left anterior.	Near median line, below umbilicus.	5 per cent.	
		Right occipito-posterior.	R.O.P.	17 per cent.	Occiput to right sacroiliac joint, forehead to left acetabulum; back in right flank; extremities to left, anteriorly; sagittal suture in right oblique diameter; shoulders in left oblique diameter, the left anterior.	In right flank, below a transverse line through umbil.	Over 9 per cent.	
		Left occipito-posterior.	L.O.P.	3 per cent.	Occiput to left sacroiliac joint, forehead to right acetabulum; back in left flank; extremities to right, anteriorly; sagittal suture in left oblique diameter; shoulders in right oblique diameter, the right anterior.	In left flank, below a transverse line through umbil.	Over 9 per cent.	
Face.	½ of 1 per cent.	Left mentoanterior.	L.M.A.	Second in frequency.	Chin to left acetabulum, forehead to right sacroiliac joint; back to right; extremities to left; face in right oblique diameter; shoulders in left oblique diameter, the left anterior.	Left side of abdomen, below umbilicus.	13 to 15 per cent.	6 per cent. or over.
		Right mento-anterior.	R.M.A.	Third in frequency.	Chin to right acetabulum, forehead to left sacroiliac joint; back to left; extremities to right; face in left oblique diameter; shoulders in right oblique diameter, the right anterior.	Right side of abdomen, below umbilicus.		
		Right mento-posterior.	R.M.P.	Most common.	Chin to right sacroiliac joint, forehead to left acetabulum; back to left; extremities to right; face in right oblique diameter; shoulders in left oblique diameter, the right anterior.	Right side of abdomen, below umbilicus.		
		Left mento-posterior.	L.M.P.	Fourth in frequency.	Chin to left sacroiliac joint, forehead to right acetabulum; back to right; extremities to left; face in left oblique diameter; shoulders in right oblique diameter, the left anterior.	Left side of abdomen, below umbilicus.		

Brow.	¼ of 1 per cent.	Left frontoanterior.	L.F.A.		Brow to left acetabulum; chin to right sacroiliac joint; back to left; extremities to right, above; face in right oblique diameter; shoulders in left oblique diameter, the right anterior.	Left side of abdomen, below umbilicus.	30 per cent.	10 per cent.
		Right frontoanterior.	R.F.A.		Brow to right acetabulum; chin to left sacroiliac joint; back to right; extremities to left, above; face in left oblique diameter; shoulders in right oblique diameter, the left anterior.	Right side of abdomen, below umbilicus.		
		Right frontoposterior.	R.F.P.		Brow to right sacroiliac joint; chin to left acetabulum; back to right; extremities to left, above; face in right oblique diameter; shoulders in left oblique diameter, the left anterior.	Right side of abdomen, below umbilicus.		
		Left frontoposterior.	L.F.P.		Brow to left sacroiliac joint; chin to right acetabulum; back to left; extremities to right, above; face in left oblique diameter; shoulder in right oblique diameter, the right anterior.	Left side of abdomen, below umbilicus.		
Shoulder.	½ of 1 per cent.	Left dorsoanterior.	L.D.A.	Most common.	Head in left iliac fossa, back anterior; extremities on right side, in upper part of abdomen; right arm presents.	Left side of abdomen, below umbilicus.	Almost 50 per cent.	11 per cent.
		Right dorsoanterior.	R.D.A.		Head in right iliac fossa, back anterior; extremities on left side, in upper part of abdomen; left arm presents.	Right side of abdomen, below umbilicus.		
		Right dorsoposterior.	R.D.P.		Head in right iliac fossa, back posterior; extremities on left side, in upper part of abdomen; right arm presents.	Right side of abdomen, below umbilicus.		
		Left dorsoposterior.	L.D.P.		Head in left iliac fossa, back posterior; extremities on right side, in upper part of abdomen; left arm presents.	Frequently cannot be heard.		
Breech.	3 to 4 per cent. of all cases.	Left sacroanterior.	L.S.A.	Most common.	Sacrum to left acetabulum; back to left anterior; abdomen to right posterior; natal cleft in right oblique diameter; intertrochanteric diameter in left oblique diameter, left hip anterior.	Left side of abdomen, above umbilicus.	30 per cent.	Less than 1 per cent.
		Right sacroanterior.	R.S.A.		Sacrum to right acetabulum; back to right anterior; abdomen to left posterior; natal cleft in left oblique diameter; intertrochanteric diameter in right oblique diameter, right hip anterior.	Right side of abdomen, above umbilicus.		
		Right sacroposterior.	R.S.P.	Second in frequency.	Sacrum to right sacroiliac joint; back to right posterior; abdomen to left anterior; natal cleft in right oblique diameter; intertrochanteric diameter in left oblique diameter, right hip anterior.	Right side of abdomen, ab. umbilicus and toward the back.		
		Left sacroposterior.	L.S.P.		Sacrum to left sacroiliac joint; back to left posterior; abdomen to right anterior; natal cleft in left oblique diameter; intertrochanteric diameter in right oblique diameter, left hip anterior.	Left side of abdomen, above umbilicus and toward the back.		

and consequently the anterior portion of the head, representing the longer bar, will be flexed upon the chest, while the vertex, or shorter bar, will present at the middle of the plane of the superior strait.

The *forces* concerned in labor are of two kinds—namely, the *positive* or *expulsive* and the *negative* or *resistant*. The former include the strongly-contracting upper uterine segment and the abdominal muscles. The action of these two elements of propulsion is identical. The uterine muscle by its contraction expels the contents of the uterine cavity by causing a diminution in the area of this cavity, while the abdominal muscles by diminishing the area of the intraabdominal cavity strongly supplement the expulsive action of the contracting uterus by displacing that organ downward and causing it to drag upon its ligamentous attachments. The ligaments themselves contract and help to fix the uterus at the brim of the pelvis. The difference between the two forces is that the one, the uterine element, is persistent throughout labor and is involuntary in its production, while the other, the abdominal element, is almost entirely voluntary and is only of service during the active second and third stages of labor. By the combined action of these two forces, which has been variously estimated as equivalent to from seventeen to sixty pounds, the liquor amnii and fetal body are displaced downward, the lower uterine segment is thinned and distended to a remarkable degree, and the vagina is dilated. This dilatation is favored by the softened and edematous condition of the cervical and vaginal tissues, together with the upward traction exerted by the longitudinal layer of muscular fibers in the uterine walls. By this latter action the uterine muscle is largely massed above the contraction-ring of Bandl, while the fibers of the lower segment are separated and stretched to an enormous extent.

The *negative forces of resistance* are, in function, entirely conservative. They are intended to prevent too precipitate

expulsion of the fetus and to favor the proper mechanism of the various positions. These forces include the resistance offered (1) by the soft parts of the parturient canal (the lower uterine segment, the cervix, the vagina, and the vulva), (2) by the bony pelvis, and (3) by the fetal body. The most important of these factors are the actions of the pelvis and of the fetal body. In the normal pelvis sufficient resistance only is afforded by the rigid walls to secure proper moulding and rotation of the advancing part, and to give to the softer structures time enough to dilate sufficiently to prevent laceration and excessive bruising. While the pelvis thus acts mainly as a resistant force, certain changes occur in its articulations during labor that facilitate the progress of the advancing part. Thus, the symphysis pubis separates slightly, and the sacrococcygeal joint permits of backward displacement of the coccyx to the extent of 2½ cm. (0.98425 in.). The sacrum varies in its position at the beginning and ending of labor. In the first stage its base is rotated backward slightly, and the entrance of the fetal head into the pelvic inlet is in this way facilitated; toward the close of labor, when the head strikes the pelvic floor, the lower portion of the sacrum rotates backward to permit of an increase in the diameters of the pelvic outlet, so that the advancing fetus may find room for its proper egress.

Fetometry.—Very essential as a resistant factor is the fetus itself, and especially on account of its bony structure does the fetal head play an important rôle in the mechanism of labor. By *fetometry* is meant the measurement of the various fetal diameters and parts. The most important of these measurements are given in the following pages.

The Fetal Skull at Term (Fig. 56).—A knowledge of the diameters and salient points of the fetal cranium is essential to a comprehension of the various cephalic presentations. The skull of the fetus at term is oval in shape, and is composed of a lower firmly-ossified portion, comprising the base of the skull and the face, and an upper yielding por-

tion, composed of seven bones that are united by membranous tissue, thus permitting of a certain amount of compressibility and overlapping. These lines of membranous junction are termed *sutures*, and receive their names according to the bones they unite and the position they hold, as follows: The *frontal*, joining the two frontal bones; the *coronal* or *frontoparietal*, joining the two frontal and the two parietal bones; the *great*, *sagittal*, or *biparietal*, joining the two parietal bones; and the *lambdoid* or *occipitoparietal*, joining the occipital and the two parietal bones. There are two others, the *temporal* or *squamous sutures*, which cannot be felt in labor and are unessential to its mechanism. In addition to these sutures, there are two other features of the fetal skull that play an important part in the mechanism of labor. These are the two membranous spaces in the cranial vault known as *fontanels* (Fig. 56). The *anterior* or *larger fontanel*, also known as the *bregma* and occasionally as the *sinciput*, is a diamond-shaped space left at the point of juncture of the frontal, coronal, and sagittal sutures. It persists as a space throughout labor, although somewhat diminished in area by the approximation of the cranial bones. The *posterior* or

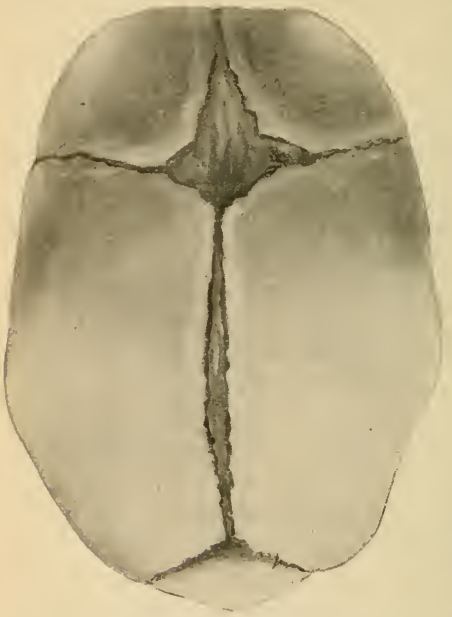
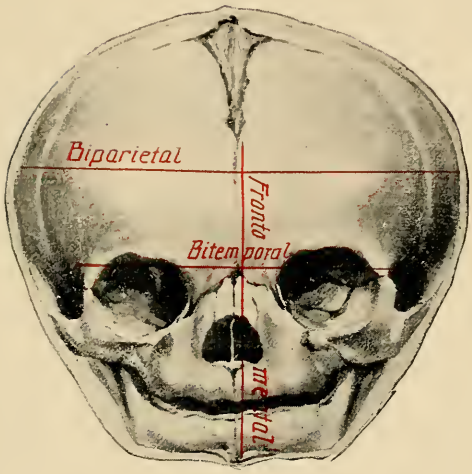


FIG. 56.—Fetal skull at term, showing anterior and posterior fontanels (Dickinson).



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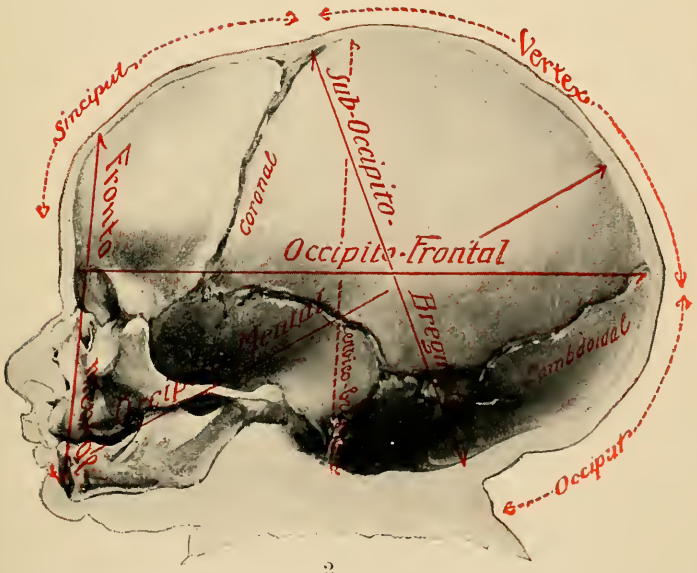

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Fetal skull seen from in front (1) and from the side (2), showing sutures, fontanels, and diameters.

	Cm.
Sub occipito Bregmatic	9.50
" " frontal	10.50
occipito frontal	11.50
" mental	13.25~
Biparietal	9.25~
Bizygomatic	12.25~

smaller fontanel is situated at the point of juncture of the lambdoid and sagittal sutures, and is triangular in shape. It ceases to be a space during labor, owing to the overlapping of the depressed occiput by the two parietal bones.

The *diameters* of the fetal skull (see Plate 1) may be divided into three sets, the transverse, the longitudinal, and the vertical. The *transverse* diameters are as follows: (1) The *bitemporal*, joining the extremities of the coronal suture, 8 cm. (3.1496 in.) in length; (2) The *biparietal*, joining the two parietal eminences, 9¼ cm. (3.6417 in.) in length: this is the greatest possible transverse diameter of the fetal skull; (3) The *bimastoid*, joining the two mastoid processes, 7⅝ cm. (3.0018 in.) in length: this is the smallest diameter of the fetal skull. The *longitudinal* diameters are—(1) The *occipitofrontal*, extending from the root of the nose to the external occipital protuberance, and measuring 11¾ cm. (4.6259 in.) in length; (2) The *occipitomental*, extending from the external occipital protuberance to the point of the chin: it measures 13½ cm. (5.3150 in.), and is the largest diameter of the fetal skull; (3) The *suboccipitobregmatic*, extending from the central point of the bregma to a point midway between the occipital protuberance and the foramen magnum: it measures 9¾ cm. (3.8386 in.) in length. The *vertical* diameters are—(1) The *frontomental*, extending from the top of the forehead to the point of the chin, and measuring 8 cm. (3.1496 in.) in length; (2) The *trachelobregmatic*, extending from the central point of the bregma to the anterior part of the foramen magnum: it measures 9½ cm. (3.7401 in.) in length; (3) The *mentobregmatic* or *cervicobregmatic*, extending from the central point of the bregma to the junction of the chin with the neck, and measuring 9¼ cm. (3.6417 in.) in length.

Other fetal measurements worthy of remembrance are the circumference of the skull through the occipitofrontal diameter, which measures 34½ cm. (13.5827 in.); the *bisacromial* diameter, that joining the two acromial processes, and

measuring 12 cm. (4.7244 in.) in length; the *bisiliac* diameter, the greatest transverse diameter of the fetal pelvis measured from crest to crest—from 9½ to 10 cm. (3.7401 to 3.9370 in.); the *intertrochanteric* diameter, that joining the two greater trochanters, and measuring 9 cm. (3.5433 in.); and the average length of a child at term—namely, 50 cm. (19.6850 in.).

Having now disposed of the preliminary matters in the subject of the mechanism of labor, we may take up in order the steps and peculiarities in the various normal mechanisms.

(1) Vertex Presentations.—The *vertex* is that conical portion of the fetal skull the apex of which is situated at the posterior fontanel; its almost circular base is the plane formed by the bisection of the biparietal and trachelobregmatic diameters. There are four possible positions for the vertex to hold after engagement in the superior pelvic strait—namely, the head occupying the right or left oblique diameter of the pelvis, with the occiput either anterior or posterior. Most commonly it is the right oblique diameter that is involved, and generally the occiput is anterior. The transverse diameter of the superior strait being the largest, Spiegelberg has found that in 81.4 per cent. of all vertex presentations the head enters the strait in this diameter, but that under the action of the resistant pelvic walls it soon comes to occupy one or other of the four positions of the vertex. In the balance of the cases the entrance into the pelvis will be primarily in one of the oblique diameters; this position is termed *Solayre's obliquity of the head.* The positions of the vertex are as follows: (1) The occiput anterior and to the left—left occipitoanterior; symbol, L. O. A.; (2) the occiput anterior and to the right—right occipitoanterior; symbol, R. O. A.; (3) the occiput posterior and to the right—right occipitoposterior; symbol, R. O. P.; (4) the occiput posterior and to the left—left occipitoposterior; symbol, L. O. P.

Mechanism of the First Position.—Left occipitoanterior—L. O. A. (Fig. 57).—About 70 per cent. of all vertex cases present in this position. *Cause.*—The reason for this great frequency may be found, in the first place, in the position of the rectum to the left side of the pelvis; this, by cutting off a portion of the left oblique diameter of the pelvis, makes it smaller than the right, in which diameter the fetus accordingly finds more room for growth and descent. In the second place, the prominence afforded by the anterior curvature of the maternal spinal column renders an anterior position of the rigid fetal back more conducive to the comfort of the fetus. *Diagnosis.—Vaginal examination* shows that the depressed occiput and smaller fontanel are anterior and pointing toward the left iliopectineal eminence. The sagittal suture runs from the small fontanel obliquely backward and to the right in the line of the right oblique diameter. The head holding a position in this diameter, the shoulders must of necessity occupy the left oblique diameter. *Examination of the abdomen* reveals the firm fetal back to the left side, with the extremities above and inclined to the right side. The fetal heart-sounds may be heard midway between the umbilicus and the left anterior superior spinous process of the ilium. *Fetal Diameters Involved.*—Before flexion the occipitofrontal, 11¾ cm. (4.6259 in.), and the biparietal, 9¼ cm. (3.6417 in.), present; after flexion, the *trachelobregmatic*, 9½ cm. (3.7401 in.), is substituted for the occipitofrontal, making a diminution of 2¼ cm. (0.8858 in.). *Steps of the Mechanism.*—The mechanism

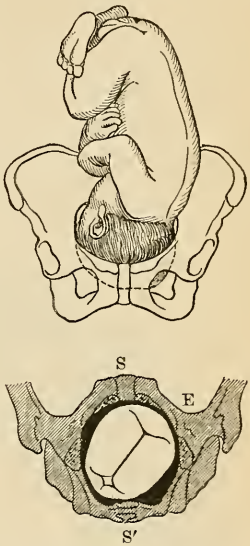

FIG. 57.—Vertex presentation, first position, L. O. A.: S, symphysis pubis; E, left iliopectineal eminence; S', sacrum.

Sub occipito bregmatic

of this, as of all presentations, may be said to consist of three processes—namely, adaptation of the fetal presenting portion to the pelvic canal, preparation of the canal for the descent of the fetal presentation, and, finally, its descent and delivery. 1. The adaptation of the fetal presentation comprises three steps of the mechanism, as follows: (1) *Preliminary flexion and moulding* to accommodate the size and shape of the fetal skull to the pelvic inlet. This occurs shortly before the onset of labor, and is the cause of the phenomenon known as "lightening." (2) With the first labor-pain the head is more thoroughly adapted to the pelvic inlet—*i. e.* more completely flexed and moulded by the downward impulse imparted to it by the uterine contraction. The extreme flexion of the head upon the trunk is termed *Roederer's obliquity* of the fetal head. (3) *Naegele's obliquity* (Fig. 58), or lateral inclination of the fetal head toward the maternal sacrum. This is produced by a crowding of the fundus uteri firmly against the spinal column. As a result the fetal trunk becomes convex anteriorly, and the left ear is pressed against the left shoulder, the right parietal bone presenting. The sagittal suture is directed, now, more posteriorly, and the examining finger must be passed farther back in order to find the vertex. According to many observers, there is some doubt as to the occurrence of this obliquity, but a careful study of the mechanical relation existing between the pres-

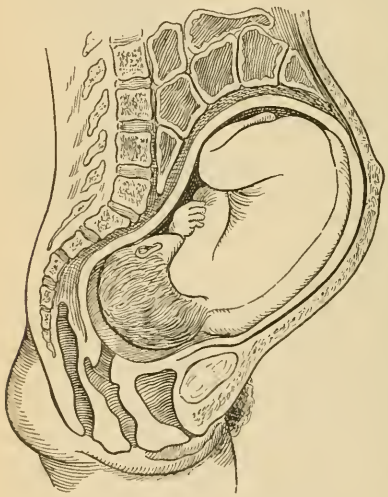

FIG. 58.—Naegele's obliquity.

entation and the parturient canal demonstrates its occurrence in varying degrees according to the intensity of the curvature of the pelvic axis. The object of this obliquity is to accommodate the direction of the presenting part to the curve of the parturient canal. 2. The fetus now being prepared to descend, the next process consists in a preparation of the canal for its descent, and this consists of but a single step—namely, *dilatation of the lower uterine segment and cervix.* This is accomplished mainly by the hydraulic action of the liquor amnii, seconded by the action of the longitudinal muscular fibers of the uterus and the edematous condition of the tissues. 3. The way being opened, the descent and delivery of the presentation are next in order. This is accomplished by the following steps: (1) *Descent of the Head to the Floor of the Pelvis.*—This is secured by means of an extension of the fetal spine, and is accompanied by a partial extension of the head, pressure being exerted by the pelvic floor upon the occipital or smaller portion of the bar, and the chin leaving the chest-wall to a moderate degree. The exact cause of the spinal extension is not known. (2) Now follows *internal anterior rotation of the occiput* from left to right, the brow at the same time rotating posteriorly into the hollow of the sacrum from right to left. There has been, and still is, considerable controversy as to why the occiput rotates anteriorly in vertex presentations. The old view, that of Baudelocque and his followers, was, that it was due to the presence of the ischial spines, which converted the pelvic cavity into two inclined planes, an *anterior* and a *posterior*, and according as to whether the head entered the one or the other of these planes was its anterior or posterior rotation determined. This view, however, failed to account for the anterior rotation of posterior positions of the occiput. Tarnier claimed that it was the outcome of the inclination of the pelvis, but the researches of Paul Dubois, and later of J. Clifton Edgar of New York, have proved conclusively that anterior rota-

tion is accomplished mainly through the agency of the tissues of the pelvic floor. This great function of the perineum has been formulated into the following law: Whatever portion of the fetal presentation first strikes the pelvic floor, whether it encounters this structure behind or in front of the median transverse line, will be directed forward under the symphysis pubis. The perineum is so attached to the bony structures of the pelvis that it forms a plane directed obliquely from above downward and from behind forward, with the lowest point terminating directly under the symphysis pubis at the vulvar orifice. As a result, the advancing head, following the direction of least resistance, rotates toward the anterior median line. In cases of relaxed or torn perineum this dominating influence is lost, and backward rotation of the occiput is common. While this is, doubtless, the main factor in the causation of anterior rotation of the presenting fetal portion, it is not the only one. According to Edgar,[1] "Accommodation; adaptation; the great principle that runs through all the mechanism of labor, whereby the long diameter of the presenting part adapts itself to the long diameter of that part of the pelvis in which it may find itself; the corkscrew-like arrangement of the pelvis; the lessened resistance caused by the urethral and vaginal orifices in front; the greater resistance of the thicker and heavier tissues in the posterior half of the pelvis; the inclination of the pelvis; the shape of the

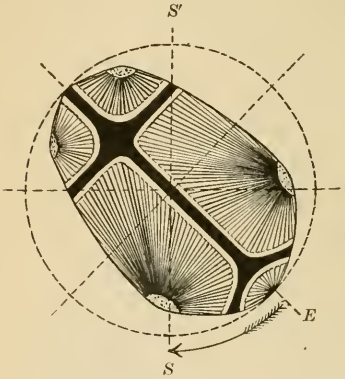

FIG. 59.—Diagram showing direction and amount of rotation of occiput in L. O. A. position: *S*, symphysis pubis; *S'*, sacrum; *E*, left iliopectineal eminence.

[1] *N. Y. Med. Jour.*, Feb. 25, 1893.

child's head; the inclination of the uterus, causing the anterior portion of the presenting part to reach the pelvic floor first,—all play their part in the causation of anterior rotation." By this movement of anterior rotation of the occiput the face is directed posteriorly toward the sacrum. The shoulders now assume a more transverse direction, although they do not correspond exactly to the transverse diameter of the pelvis. (3) *Birth of the Head by a Process of Extension.*—This is the result of a combination of forces that may be grouped as follows: (*a*) The expulsive action of the uterus; (*b*) the contraction of the perineal muscles; (*c*) the absence of resistance in front in the line of the vulvar orifice. The occiput becoming lodged under the symphysis pubis, the latter acts as a fulcrum, and the force of the uterus is transmitted through the spinal column of the child to the anterior portion of the fetal head. This, being propelled from behind and finding diminished resistance in front, commences to extend, the action being aided by the upward pressure exerted by the distended perineum, which slips backward over the advancing face. According to Edgar, the occiput escapes from beneath the symphysis just prior to the time that the chin leaves the sternum, and in this way the smallest diameters of the fetal head, the *suboccipitobregmatic*, the *suboccipitofrontal*, and the *suboccipitomental*, pass in succession through the vulvar orifice, which thus escapes over-distention and consequent laceration. The order of appearance of the parts of the face from under the retracting perineum is—(1) The supraorbital ridges; (2) the nose; (3) the upper jaw; (4) the mouth; (5) the chin. Simultaneously with the birth of the head there occurs a descent of the shoulders to the pelvic floor. (4) *Restitution.*—The head is born with the face directed posteriorly. Immediately after the birth has been accomplished the head turns so as to occupy an oblique diameter, the occiput holding a position corresponding to that held by it prior to the internal anterior rotation, and the face

being directed toward the right sacroiliac synchondrosis. This occurs as a result of the elasticity of the structures of the fetal neck, which have been twisted by the rotation of the head upon the shoulders; the head now resumes its normal relationship to the shoulders, and this process is termed *restitution* (Fig. 60). It is most marked in posterior positions of the occiput. (5) *External Rotation of the Head.*—With the return of a pain the backward movement of the occiput begun in restitution is continued until the head rotates through a quarter of a circle. The occiput now is turned toward the maternal thigh corresponding to the side of the pelvis in which it originally lay — in this position the left—while the face is directed to the right thigh. This movement is produced by rotation of the right shoulder anteriorly upon the pelvic floor. The right shoulder first striking the perineum to the right of the anteroposterior diameter of the pelvis, it is rotated anteriorly under the symphysis, but in a reversed direction from that taken by the head—namely, from the right to the left. The bisacromial diameter now corresponds to the conjugate diameter of the pelvic outlet, and the right or anterior shoulder is in relationship with the symphysis pubis. Owing to the softness of the tissues of the shoulder, this rotation is not in every instance as complete as is the anterior rotation of the head. (6) *Birth of the Shoulders.*—The question as to which shoulder first appears at the vulvar orifice has been very fairly tested by Edgar in a

Fig 60.—Restitution.

series of observations, the result of which he reported at the eighteenth annual meeting of the American Gynecological Society. He has found that in spontaneous delivery in primiparæ the two shoulders appear first at the outlet with about equal frequency, while in multiparæ the posterior shoulder is seen first most commonly. In both classes of patients the left or posterior shoulder is born first in the great majority of the cases—three and one-half times as frequently as the anterior in primiparæ, and two and one-half times as frequently as the anterior in multiparæ. (7) *Expulsion of the Trunk.*—This is rapidly accomplished by a spiral movement, the body of the child almost falling into the hands of the obstetrician.

Mechanism of the Second Position, Right Occipitoanterior—R. O. A. (Fig. 61).—This is the third position in frequency, occurring in about 10 per cent. of all cases. *Diagnosis.—Vaginal examination* shows that the depressed occiput and smaller fontanel are anterior and

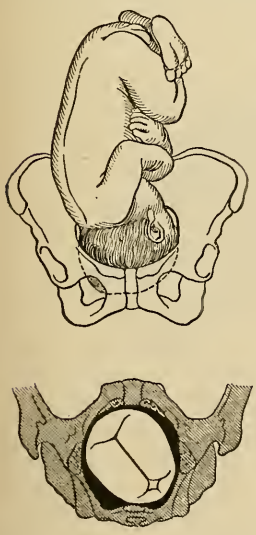

Fig. 61.—Vertex presentation, R. O. A.

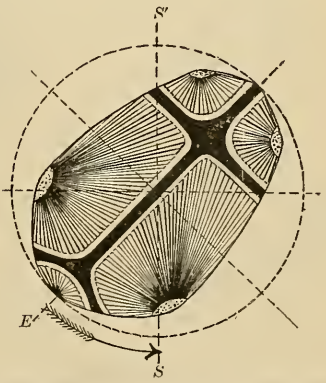

Fig. 62.—Diagram showing direction and amount of rotation of occiput in R. O. A. position: *S*, symphysis pubis; *S'*, sacrum; *E*, right iliopectineal eminence.

pointing toward the right iliopectineal eminence. The sagittal suture runs from the small fontanel obliquely backward and to

the left in the line of the left oblique diameter of the pelvis, the shoulders holding a position at right angles to this in the right oblique diameter. *Examination of the abdomen* reveals the fetal back to the right side, with the extremities above and to the left side. The fetal heart-sounds may be heard midway between the umbilicus and the right anterior superior spinous process of the ilium. *Fetal Diameters Involved.*—The same fetal diameters come into play as in the first position. *Steps of the Mechanism.*—These are the same as for the first position, with the exception of the rotation, which, in the case of the occiput, takes place from right to left anteriorly (Fig. 62), the brow rotating from left to right posteriorly, and the left shoulder rotating from left to right anteriorly. After restitution the fetal head is directed to the left sacroiliac synchondrosis.

Fig. 63.—Vertex presentation, R. O. P.

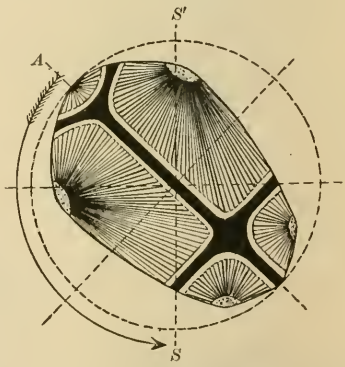

Fig. 64.—Diagram showing direction and amount of rotation of the occiput in R. O. P. position: *S*, symphysis pubis; *S'*, sacrum; *A*, right sacroiliac synchondrosis.

Mechanism of the Third Position, Right Occipitoposterior—R. O. P. (Fig. 63).—About 17 per cent. of all vertex cases present in this position, it being the second position of the fetus in the right oblique pelvic diameter. *Diagnosis.—Vaginal examination* shows that the depressed occiput and

smaller fontanel are posterior and pointing to the right sacroiliac synchondrosis. The sagittal suture runs from the small fontanel obliquely forward and to the left in the line of the right oblique diameter of the pelvis; the shoulders are at right angles to this in the left oblique diameter. It is possible in this position to feel the anterior fontanel high up anteriorly. *Examination of the abdomen* reveals the fetal back to the right side posteriorly, with the extremities above and to the left anteriorly. The fetal heart-sounds may be heard in the right flank just below the umbilicus. *Fetal Diameters Involved.*—These are the same as in the first position of the vertex (Fig. 64). The *steps of the mechanism* are the same as those of the second position, with one exception. In order to rotate anteriorly the occiput must pass through three-quarters of a half-circle, and this necessitates anterior rotation of the shoulders through a quarter of a circle at the superior strait, in order to prevent undue twisting or even fracture of the neck; the shoulders thus come to occupy the right oblique pelvic diameter with the left shoulder anterior. This mechanism is accompanied by an increase in the severity of the labor-pains, together with a prolongation of the labor, and is attended with greater risk to the child and more danger of laceration of the perineum. Finally, the left shoulder rotates anteriorly from left to right, while the right sweeps posteriorly from right to left across the promontory of the sacrum. After restitution the fetal head is directed to the left sacroiliac synchondrosis.

Mechanism of the Fourth Position, Left Occipitoposterior—L. O. P. (Fig. 65).—This position is quite rare on account of the diminution of the left oblique diameter consequent upon the position of the rectum. It is claimed that not more than 3 per cent. of all vertex presentations occupy this position. *Diagnosis.—Vaginal examination* shows that the depressed occiput and smaller fontanel are posterior and pointing to the left sacroiliac synchondrosis. The sagittal suture runs from the small fontanel obliquely forward and

to the right in the line of the left oblique diameter of the pelvis; the shoulders are at right angles to this in the right oblique diameter. The anterior fontanel may also be felt high up anteriorly. *Examination of the abdomen* reveals the fetal back to the left side posteriorly, with the extremities above and to the right anteriorly. The fetal heart-sounds may be heard in the left flank just below the transverse line passing through the umbilicus. *Fetal Diameters Involved.*—These are the same as in the first position. The *steps of the mechanism* are the same as those of the third position, with the exception of rotation, which, in the case of the occiput, takes place anteriorly from left to right (Fig. 66), the brow rotating from right to left posteriorly, and the right shoulder from right to left anteriorly. After restitution the fetal head is directed to the right sacroiliac synchondrosis.

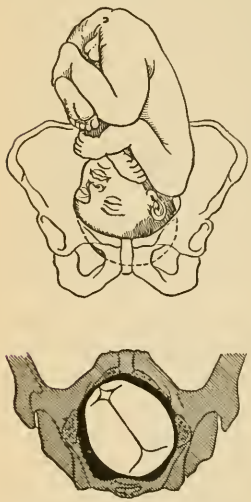

FIG. 65.—Vertex presentation, L. O. P.

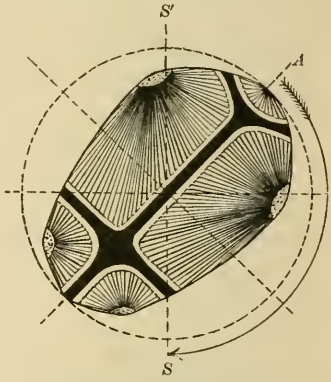

FIG. 66.—*S*, symphysis pubis; *S'*, sacrum; *A*, left sacroiliac synchondrosis.

(2) PELVIC PRESENTATIONS.—By this term is meant the presentation of the pelvic extremity of the fetal ellipse at the center of the plane of the superior strait of the maternal pelvis. It occurs in about ~~1.3 per cent.~~ of all cases at term,

1 in 60 = 1.6 %

1 in 30 = 3.3%

and in from 3 to 4 per cent. of all cases of labor, and is most common in premature births and in multiparæ. *Varieties.*—Pelvic presentations include those of the breech, of one or both feet, and of the knee. In the *complete* presentation of the breech the buttocks present with the thighs flexed upon the pelvis, the legs upon the thighs, and the feet crossed and flexed against the buttocks. *Incomplete* presentations of the breech depend upon alterations in the amount of flexion of the limbs; consequently there are several varieties met with, as follows: (*a*) The thighs may be flexed upon the pelvis, but the legs are extended so that the feet are in close proximity to the face; (*b*) one leg may be flexed and the other fully extended: this is very rare; (*c*) the legs may be flexed upon the thighs, but the thighs imperfectly flexed upon the pelvis: this is known as a *knee presentation* (Fig. 67), and is extremely rare, occurring but once in over 3000 cases (La Chapelle); (*d*) there may be

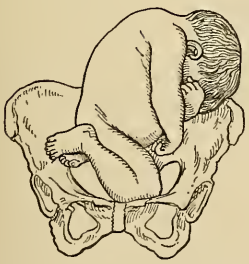

FIG. 67.—Knee presentation.

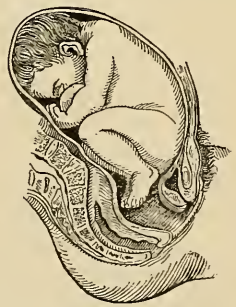

FIG. 68.—Foot presentation.

almost complete extension of the lower limbs, constituting the so-called *foot* or *footling* presentation (Fig. 68): this occurs in a little over 1 per cent. of all breech cases, and is probably due to a sudden escape of liquor amnii in a normal breech presentation, carrying down with it the prolapsed limb; or it may result from violent fetal movements. *Causes of Breech Presentation.*—As regards the etiology of pelvic pres-

entations much has been written. Among the most probable factors in their causation may be mentioned—(1) Premature delivery, the under-size of the fetus favoring undue mobility, whereby either extremity of the fetal ellipse might engage in the superior strait; (2) multiparity, the uterus becoming flabby and distorted with the successive pregnancies, so that unusual fetal presentations can the more readily occur; (3) pelvic contraction; (4) excessive amount of liquor amnii, again favoring excessive fetal mobility; (5) an over-size of the uterus; (6) an under-developed fetus; (7) hydrocephalus, in which case the cephalic becomes the more bulky extremity of the fetal ellipse, and therefore more readily accommodated in the fundus uteri; (8) fetal monstrosities; (9) deformity of the uterus, as, for instance, when there is an excessive distention of the lower uterine segment, reversing the normal uterine type; (10) multiple pregnancy: in about 25 per cent. of twin pregnancies the breech will present. *Diagnosis.*—There are some striking points in a breech presentation that will generally make the diagnosis plain. Thus, *examination of the abdomen* will reveal the movable head near the fundus uteri, and this will give the symptom of cephalic ballottement. Beneath the head may be felt the groove corresponding to the neck, and below it is the shoulder. In the region of the iliac fossæ is a broad irregular mass almost or quite immovable; this is the fetal trunk. Auscultation will reveal the fetal heart-sounds above the level of the umbilicus and to one or the other side. *Vaginal examination* will reveal an absence of the hard and protruding vertex, and will show instead a high position of the presenting part, which, indeed, may at first be beyond the reach of the finger; the bag of water presents the characteristic peculiarity common to this as well as to certain malpresentations—namely, a finger-like protrusion through the dilating os; when the membranes rupture there is an abrupt and complete escape of the liquor amnii instead of the gradual draining away of the

fluid as in vertex presentations; this results from the non-adaptation of the presenting part to the orifice of the uterus. Later in labor, especially after rupture of the membranes, the distinguishing features of the breech may be recognized. These consist in the anus, the buttocks and intervening sulcus, the two ischial tuberosities, the movable tip of the coccyx, the sacrum with its rough spinous processes, and the external genitalia. Quite recently Pinard has suggested a new sign of breech presentation. He claims that in about 70 per cent. of the cases after the sixth month of gestation a sharp pain is produced by placing the hand upon the fundus uteri. This pain, he says, is sometimes spontaneous, and disappears after version is performed. Its cause is not stated. This observation has not as yet been verified by other obstetricians. *Diagnosis of a Breech from a Face.*—It is quite possible, upon a superficial exploration, especially if the examiner be inexpert, to confound a breech presentation with that of a face. Attention to the following points of difference, however, will overcome this difficulty:

Breech.	*Face.*
Abdominal palpation will reveal the movable head above, upon which cephalic ballottement may be practised.	Abdominal palpation will show the breech and extremities above.
The anus may be distinguished by the absence of bony ridges, by its small size, and by the sphincteric action.	The mouth may be recognized by its large size, by the presence of the hard bony alveolar ridges, and by the absence of sphincteric action.
There is a discharge of meconium.	No meconium is discharged.
The sharp spinous processes of the sacrum may be felt.	There are no corresponding processes to be detected.
There are no other prominent bony structures to be distinguished.	There is to be noted the presence of the hard orbital borders and the smooth, broad forehead.

Some difficulty may be experienced in incomplete breech presentations in distinguishing the foot from a hand. The following points of difference must be borne in mind:

Foot.	*Hand.*
This is at right angles to the leg.	This is in a straight line with the arm.
The inner border is thicker than the outer.	Both borders are of equal thickness.
The toes are short and are in a straight line.	The fingers are longer, and the thumb is at right angles to the other digits.

Foot.	*Hand.*
The great toe cannot be altered in its relation to the remaining toes.	The thumb may be bent across the palm, and thus brought into contact with the other fingers.
The toes cannot be separated to any great extent.	The thumb and first finger may be considerably separated.
The malleoli and heel (projecting os calcis) may be felt.	There is an absence of such features.
The ankle-joint is not freely movable.	The wrist-joint is quite movable.

The particular foot, whether right or left, may be recognized by noting the relationship existing between the great toe and the other toes, and the thick internal border and the heel.

In presentation of the knee the obstetrician will be called upon to distinguish this joint from the other possible joint presentations—namely, those of the elbow and the shoulder. This may be done as follows:

Points of Difference between a Knee and an Elbow or a Shoulder.

Knee.	*Elbow.*	*Shoulder.*
There are two tuberosities to be felt, with an intervening depression.	There is but one sharp tuberosity, with a depression on one side, and two lateral prominences.	There is but one prominence, which communicates with the acromion and clavicle; the general outline is more rounded than that of either the knee or the elbow.
Abdominal palpation reveals a horizontal position of the fetus *in utero*.	The fetus occupies a transverse position *in utero*.	The fetus occupies a transverse position *in utero*.

Mechanism of Pelvic Presentations.—The mechanism is the same, no matter what portion of the pelvic extremity offers at the plane of the superior strait. As in vertex presentations, there are four possible positions for the breech to hold, and these are named according to the position of the sacrum, thus: (1) The sacrum anterior and to the left—left sacroanterior; symbol, L. S. A.; (2) the sacrum anterior and to the right—right sacroanterior; symbol, R. S. A.; (3) the sacrum posterior and to the right—right sacroposterior; symbol, R. S. P.; (4) the sacrum posterior and to the left—left sacroposterior; symbol, L. S. P.

Some authors have taken the trouble to classify the various positions of foot and knee presentations. Thus, those of the foot are named according to the direction of the os calcis, as follows: (1) The calcaneum anterior and to the left—left calcaneoanterior; symbol, L. C. A.; (2) the calcaneum anterior and to the right—right calcaneoanterior; symbol, R. C. A.; (3) the calcaneum posterior and to the right—right calcaneoposterior; symbol, R. C. P.; (4) the calcaneum posterior and to the left—left calcaneoposterior; symbol, L. C. P. Knee presentations are named according to the position of the tibia, thus: (1) The tibia anterior and to the left—left tibioanterior; symbol, L. T. A.; (2) the tibia anterior and to the right—right tibioanterior; symbol, R. T. A; (3) the tibia posterior and to the right—right tibioposterior; symbol, R. T. P.; (4) the tibia posterior and to the left—left tibioposterior; symbol, L. T. P. This seems to be an unnecessary multiplication of terms and symbols, for in either instance the presentation quickly resolves itself into one of the breech, passing through the same mechanism.

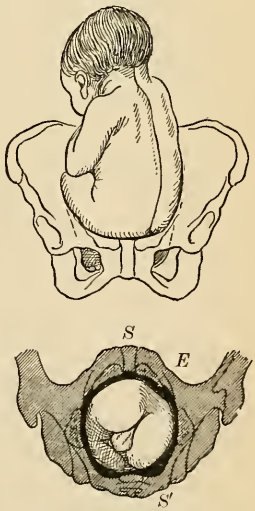

FIG. 69.—Breech presentation, L. S. A.

Mechanism of the First Position, Left Sacroanterior — L. S. A. (Fig. 69).—*Diagnosis.—Vaginal examination* shows that the sacrum is anterior and pointing toward the left iliopectineal eminence; the natal cleft, or groove between the buttocks, lies in the right oblique diameter of the pelvis and the transverse (bisiliac or intertrochanteric) diameter of the buttocks in the left oblique diameter. The left hip is situated anteriorly toward the right acetabulum, while the right hip is directed toward the left sacroiliac synchondrosis. *Examination of the abdomen* reveals the firm fetal back to the left

side anteriorly, while the abdomen is directed posteriorly and to the right. The fetal heart-sounds may be heard to the left of the abdomen midway between the umbilicus and the margin of the ribs. *Fetal Diameters Involved.*—The bisiliac, from 9½ to 10 cm. (3.7401 to 3.9370 in.), and the conjugate. *Steps of the Mechanism.*—(1) Owing to the soft and elastic structures of the breech but little or no adaptation of the fetal presentation to the shape of the maternal pelvis takes place; there occurs generally, however, a slight backward inclination of the body toward the sacrum to accommodate its direction to the axis of the parturient canal. (2) The first step of this mechanism may therefore be said to be a slow descent of the breech to the pelvic floor, and this may in a primipara require twenty-four hours for its performance. This delay is due to the fact that there is not sufficient irritation of the uterine muscles produced by the yielding breech to give rise to active labor-pains, nor does the soft presentation impinge upon the lower uterine segment with a force sufficient to produce rapid dilatation of the os. (3) *Internal Anterior Rotation of the Hips.*—Having reached the pelvic floor, there follows a slow and imperfect rotation of the anterior or left hip forward from the right to the left until it lies under the symphysis pubis, and the bisiliac diameter almost corresponds to the conjugate diameter of the pelvic outlet. In some instances there occurs a complete failure of internal rotation, the hips being delivered in a transverse position. The imperfection of this step of the mechanism is due to the inadequate resisting power offered by the soft fetal structures. (4) *Lateral Flexion and Birth of the Hips.*—The anterior hip becoming fixed under the symphysis, the right or posterior hip is driven over the retracting perineum, and is usually born first; in quick succession the left hip, the limbs, and the trunk appear, and the child is born as far as its waist. (5) Following this there is a slight effort at *restitution*, for the shoulders have maintained their oblique position, and ante-

rior rotation of the hips has produced a certain amount of twisting of the vertebral column. The left hip shows a slight tendency to turn toward the right maternal thigh. (6) There is now an engagement and descent of the shoulders in the left oblique diameter of the pelvis until the pelvic floor is reached. (7) *Anterior rotation* of the left shoulder from right to left, the bisacromial diameter then corresponding to the conjugate diameter of the pelvic outlet. (8) *Delivery of the arms* (which in spontaneous breech delivery remain flexed upon the thorax) and of the shoulders—first the posterior or right, and finally the anterior or left. This is followed by a second slight effort at restitution. (9) *Engagement and descent of the head* in the right oblique diameter, the occiput looking toward the left iliopectineal eminence. (10) *Anterior rotation of the occiput* from left to right (with posterior rotation of the brow from right to left) until it becomes fixed under the symphysis pubis. (11) *Delivery of the head by a process of flexion*, the parts appearing from under the retracting perineum in the following order: chin, face, forehead, bregma; finally, the occiput emerges from beneath the symphysis and the head is born.

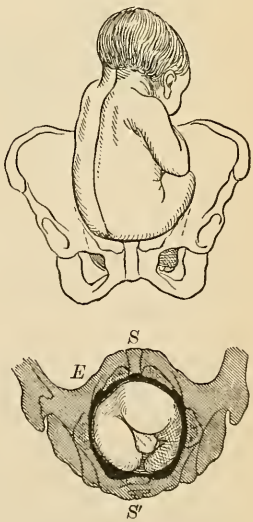

FIG. 70.—Breech presentation, R. S. A.

Mechanism of the Second Position, Right Sacroanterior — R. S. A. (Fig. 70).—*Diagnosis.—Vaginal examination* shows that the sacrum is anterior and pointing toward the right iliopectineal eminence; the natal cleft lies in the left oblique, and the bisiliac diameter in the right oblique pelvic diameter. The right hip is situated anteriorly toward the left acetabulum, while the left hip is directed toward the right sacroiliac synchon-

drosis. *Examination of the abdomen* reveals the fetal back to the right side anteriorly, while the abdomen is directed posteriorly and to the left. The fetal heart-sounds may be heard to the right side of the abdomen midway between the umbilicus and the margin of the ribs. *Fetal Diameters Involved.*—The same as in the first position. *Steps of the Mechanism.*—The same as in the first position, rotation, however, occurring in the opposite direction; thus the hips and the shoulders rotate from left to right, the occiput from right to left, and the brow from left to right.

Mechanism of the Third Position, Right Sacroposterior—R. S. P. (Fig. 71).—This is the second position of the breech in the order of frequency. *Diagnosis.—Vaginal examination* shows that the sacrum is posterior and pointing to the right sacroiliac synchondrosis; the natal cleft lies in the right oblique, and the bisiliac diameter in the left oblique pelvic diameter. The right hip is situated anteriorly toward the right acetabulum, while the left hip is directed toward the left sacroiliac synchondrosis. *Examination of the abdomen* reveals the fetal back to the right side posteriorly, while the abdomen is directed anteriorly and to the left. The fetal heart-sounds may be heard to the right side of the abdomen above the umbilicus and toward the back. *Fetal Diameters Involved.*—The same as in the first position. *Steps of the Mechanism.*—These are virtually the same as in the first position, rotation, however, taking place as follows: The hips and shoulders rotate from right to left anteriorly, the occiput from right to left anteriorly, and the brow from left to right posteriorly.

Mechanism of the Fourth Position, Left Sacroposterior—L. S. P. (Fig. 72).—*Diagnosis.—Vaginal examination* shows that the sacrum is posterior and pointing to the left sacroiliac synchondrosis; the natal cleft lies in the left oblique, and the bisiliac diameter in the right oblique pelvic diameter. The left hip is situated anteriorly toward the left acetabulum, while the right hip is directed toward the right sacroiliac

synchondrosis. *Examination of the abdomen* reveals the fetal back to the left side posteriorly, while the abdomen is directed anteriorly and to the right. The fetal heart-sounds may be heard to the left side of the abdomen above the um-

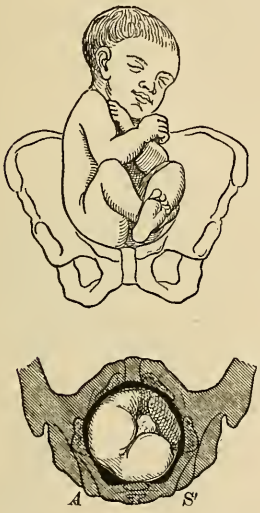

FIG. 71.—Breech presentation, R. S. P.

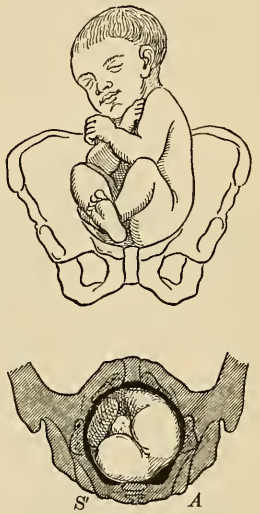

FIG. 72.—Breech presentation, L. S. P.

bilicus and toward the back. *Fetal Diameters Involved.*—The same as in the first position. *Steps of the Mechanism.*—The same as in the third position, with reversal of the direction of rotation.

Mechanism of the Third Stage of Labor.—There are various views advanced as to the manner in which the placenta becomes detached from the uterine wall. The most probable one, and that which is now generally accepted, is that of diminution in the area of placental attachment. According to this view the elastic placental tissue follows up the contracting uterus to a certain extent, probably to one-half of its transverse diameter, and then, further condensation of its tissues becoming impossible, with the succeeding pain it is

sprung off *en masse*. Another view that has found some favor is that there occurs a partial central detachment of the placenta with subsequent retroplacental hemorrhage. The resulting clot, increasing in size, occasions further separation with final complete detachment of the organ. The separation always takes place in the decidual portion of the placenta—hence the possibility of postpartum hemorrhage.

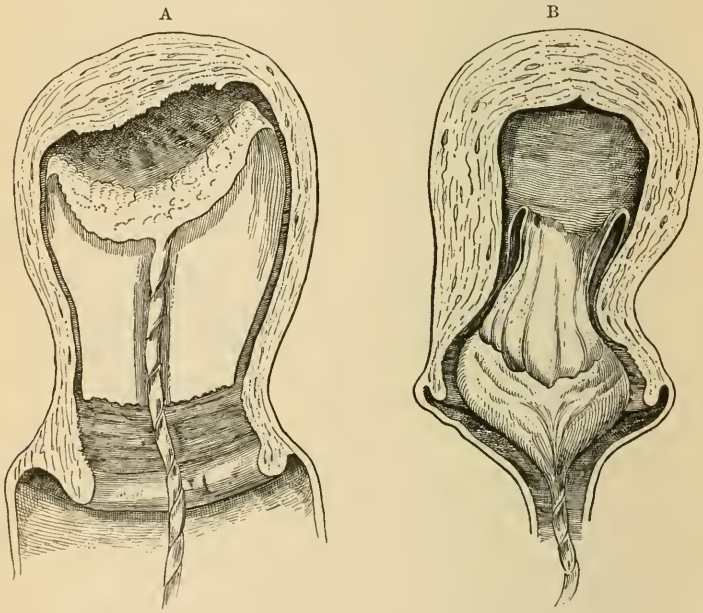

FIG. 73.—Separation of placenta from fundal attachment: A, commencing inversion of placenta; B, inversion complete, dragging membranes on maternal surface.

Two theories as to the manner in which the detached placenta is expelled from the uterus and vagina have been advanced. That of Schultze is probably the true one—namely, that the placenta is bent upon itself, and, passing through the membranes, which are expelled last, is discharged through the os, the membranes dragging after it in the form of an inverted umbrella (Fig. 73, B). Duncan

believes, we judge incorrectly, that the placenta is slid down the lower uterine segment and through the vagina edgewise, dragging with it the attached membranes.

Prognosis of Normal Labor.—The prognosis of normal labor is good for the mother. In properly-managed cases of either vertex or breech presentation the maternal mortality is less than 1 per cent. The liability to laceration of both cervix and perineum, however, is greater in presentations of the breech than in those of the vertex, and this liability is increased in proportion to the manual efforts required to facilitate the delivery of the child. It is different, however, for the fetus. During the intricacies of the mechanism of the different positions and presentations the fetal life is more or less endangered; it has been found that in the easier anterior positions of the vertex at least 5 per cent. of the children will lose their lives, while in the more difficult posterior positions over 9 per cent. will perish. Still more grave is the prognosis for the child in cases of breech presentation; here probably 30 per cent. of the children will be still-born, while a number of the remaining 70 per cent. will suffer more or less injury during the process of delivery. This mortality arises from various causes which may be grouped as follows: (1) *Compression of the Funis.*—While the cord may be compressed at any period during labor, the greatest danger exists during the delivery of the head; hence arises the necessity for rapid termination of labor at this stage of the mechanism. The pressure may be exerted by either the trunk or the head of the fetus against the pelvic or vaginal walls; if it be maintained for over five minutes, fetal death from asphyxiation is imminent. (2) *Disturbance or Arrest of Placental Respiration.*—This may follow compression of the placental tissue between the contracting uterus and the fetal skull, due to the complete escape of the liquor amnii; or there may be a more or less premature separation of the placenta with arrest of its respiratory function. (3) *Prolapse of the funis*, a not uncommon

accident, due to the sudden escape of the liquor amnii and the imperfect adaptation of fetal to maternal parts. (4) *Coiling of the cord* around the fetal body and extremities. (5) *Extension of the head;* by this complication delivery of the head will be retarded. (6) *Extension of the arms*, also retarding delivery of the head. (7) *Prenatal Inspiratory Efforts.*—The inspiration of foreign material through gasping efforts on the part of the fetus while the head is still contained within the vagina may result in immediate suffocation or in the development of pneumonia shortly after birth. (8) In addition to the foregoing, the child in a pelvic presentation is exposed to a multitude of traumatisms that may contribute materially to the fetal mortality. Thus, should forceps be used, there is increased danger of compression of the fetal skull; fractures of the arm, leg, clavicle, and cranial bones, and separation of the epiphyses, are not rare; vertebral and spinal lesions are occasionally noted, as are also injuries to joints or to the thoracic or abdominal viscera, laceration of the muscles of the neck or thorax, injuries of the cerebral sinuses and of the mouth and its floor, fracture of the sacroiliac joint, lesions of nerve-plexuses, and the production of caput obstipum or wry-neck. This torticollis has been thought by Strohmeyer and Dieffenbach to be the result of a hematoma in the sternocleidomastoid muscle, the result of excessive stretching and torsion, and by others as merely due to a thickening or induration of the muscle fibers. Koettnitz,[1] who has investigated this subject, concludes that caput obstipum appears immediately at birth as a result of intrauterine influences, or it may appear soon, or be first observed some time later in the puerperium, apparently in consequence of lesions of the muscle caused by the forces of labor.

Management of Normal Labor.—The treatment of labor requires considerable skill on the part of the attending physician, as well as the exercise of much judgment to

[1] *Volkmann's Sammlung*, No. 88.

determine when interference upon his part is indicated and when contraindicated. Well-timed efforts will save many a perineum or prevent a serious complication, while the same efforts misapplied will result in either maternal or fetal injury or death, or both. There are some set rules, therefore, which it becomes necessary for every obstetrician to bear in mind and to enforce during the progress of an ordinary case of labor.

(1) *The Obstetric Call.*—Immediate response to the summons to a confinement case is imperative; by the rigid observance of such a rule a malpresentation may be corrected in time, or the delivery of the child before the arrival of the physician, with consequent perineal laceration, postpartum hemorrhage, eclampsia, or infantile asphyxiation, may be prevented.

(2) *The Obstetric-case.*—There are certain articles that should be on hand in every case of labor: some of these may be provided by the patient, and should be had in readiness for the doctor's call; other articles should be carried in the properly-filled obstetric-case. When engaged to attend upon a patient during her expected confinement the physician should give directions to the patient or nurse to have the following articles secured beforehand in case they should be required: Plenty of soft, clean towels; a large-sized, unused, and prepared antiseptic sponge; a roll of narrow tape or some strong thread for the cord; an abundance of water, hot and cold; ether, 1 pound; vinegar, ½ pint; brandy or whisky, 2 ounces; a bed-pan; a new soft-rubber catheter; a vaginal syringe (fountain or Davidson); a roll of salicylated cotton; a roll of absorbent cotton; the occlusive dressing (Hirst); two or three dozen lochial pads; a pair of scissors. In the obstetric-case should be found the following articles: Obstetric forceps, a long and a short pair; a pocket-case of instruments; a hypodermic syringe; a needle-holder; tablets of mercuric chlorid; fluid extract of ergot, 2 ounces; a

10 per cent. solution of cocain, 1 ounce; 5 per cent. carbolized vaselin, 2 ounces; a solution of creolin of such strength that 1 dram to 1 pint of water will make a 2 per cent. solution; a bottle of iodoform-gauze; a small roll of absorbent cotton; a set of Barnes' dilators; a set of Hegar's dilators; chloroform, 5 ounces; Monsel's solution, 2 ounces; a small faradic battery; a stethoscope; pure carbolic acid, 6 ounces; a solution of chloral hydrate, 20 grains to the dram, 2 ounces.

(3) *The Use of Antisepsis.*—The imperative necessity of an antiseptic management of labor is now universally recognized, and the following rules and suggestions should be strictly adhered to, in order to ensure safety for the patient during the lying-in period. There is probably no condition in which a patient is more susceptible to the action of pathogenic germs than after labor; she has gone through a siege of suffering and bodily toil that has exhausted all of her surplus vitality and resisting powers; there are numerous abrasions and lacerations throughout the genital tract to which the germs of putrefaction find ready access, and there is no better culture-medium than blood-serum. Having once found entrance into the nidus thus prepared by labor, these infective microorganisms generate organic products of extreme virulence known as *ptomains*, and these when absorbed into the system give rise to the symptoms of puerperal sepsis. It becomes, therefore, a question of the utmost importance to the obstetrician in attendance upon a given case of labor how best to avoid the possibility of septic infection of his patient during and after the process of parturition. From numerous experiments made in the large maternity institutions in this country and abroad it has been found that *creolin*, a coal-tar product deprived of its carbolic acid and possessed of highly antiseptic properties, is, in the strength of a 2 per cent. solution, most effective in destroying the pathogenic germs, and is the safest of the germicides because of its

Sloane rules
Scrub soap water. 5 min
Alcohol 95% 1 min

nontoxicity. Other antiseptic agents that may be employed, although some of them are of rather inferior value, are boiling water, mercuric chlorid and biniodid (1 : 4000 to 1 : 2000), and salicylic and carbolic acids. By the use of such agents and the observance of other proper precautions to secure thorough asepsis, the mortality of labor may be reduced to its minimum and the greater comfort and happiness of the patient be assured.

(*a*) *The Room.*—In choosing a room for the confinement, one that is large, with plenty of air and light, sufficiently heated, and not in close proximity to a bath-room or a water-closet, should be preferred. An open fireplace is a valuable means of ventilation, and, if possible, a room with such a convenience should be selected. All unnecessary furniture, hangings, and bric-à-brac should be temporarily removed, and the room rendered as cleanly and aseptic as possible.

(*b*) *Disinfection of the Physician and the Nurse.*—One of the commonest methods by which a puerperal patient may become infected is through the improperly or imperfectly disinfected hands of her medical attendants. It is unfortunate that the introduction of the fingers into the genital tract of a woman in labor is necessary, but, this being the case, it is most essential to submit the examining hands to such recognized precautionary antiseptic measures as will best ensure the patient's safety from germ-infection. Indeed, some of the leading obstetricians, notably Leopold and Spörlin[1] of Germany, have recently advocated limiting examinations made in the course of ordinary labor to the external parts, thereby avoiding the danger of infecting the membranes: they claim that the position and presentation of the fetus may be recognized by external manipulation alone, and vaginal exploration need only be made to determine the presence of pathologic conditions of the birth-canal.

There are in vogue a number of special methods of ren-

[1] *Archiv f. Gynäk.*, Band xlv. Heft 2.

dering the hands aseptic, best known among which are Kelly's or the permanganate method and Fürbringer's method. *Kelly's method* is as follows: 1. The hands and nails (closely pared) are scrubbed for ten minutes in water, frequently changed, at about 40° C. (104° F.), a sterilized brush being used; 2. The hands and forearms are then immersed in a solution of potassium permanganate (made by adding an excess of the salt to boiling distilled water) until stained a deep mahogany-red; 3. They are then immersed in a saturated solution of oxalic acid until completely decolorized; 4. After this they are cleansed in warm sterilized water. *Fürbringer's method* is as follows: 1. The pared nails are cleaned with a pointed steel; 2. The hands and forearms are scrubbed for from one to three minutes with soap and hot water and a sterilized brush; 3. The soap is removed by immersing in clean hot water; 4. The hands and arms are then immersed in 95 per cent. alcohol for one minute; 5. Still wet with the alcohol, they are immersed for one minute in a freshly-prepared mercuric-chlorid solution (1 : 500 or 1 : 1000). The finger, sterilized by one of the foregoing methods, should be lubricated with a 5 per cent. carbolized vaselin and the examination proceeded with. The hands of the nurse should pass through the same cleansing process. The clothing of the physician should be freed from the dust of infectious diseases, and his linen should be fresh and clean. The nurse's clothes are to be thoroughly washed in carbolized or mercurial solution and freshly donned for the occasion.

(*c*) *Disinfection of the Patient.*—As soon as labor-pains begin to manifest themselves the patient should be given a full bath and the external genitalia cleansed with green-soap and alcohol, and this followed by an application of mercuric chlorid (1 : 1000). A vaginal douche should not be given before labor, to avoid the introduction of germs with the nozzle of the syringe. The clothing should be changed

completely. After the pains have become well established an enema of a pint of soapsuds with 1 dram of turpentine may be administered, after which the parts should be again disinfected by the mercuric-chlorid solution.

(*d*) *Preparation and Disinfection of the Bed.*—The bed should not be excessively low, and should be placed in the center of the room, so as to be easy of access; it should contain a hair- or spring-mattress, and over this should be placed a rubber blanket for the protection of the latter. A sheet is spread above this. The linen used should be absolutely clean ~~and well sterilized in mercuric chlorid.~~ Over the sheet should be placed the special coverings that are to be removed at the termination of labor. These, as adopted now almost universally, consist, from below upward, of a rubber blanket, a sterilized sheet, and a large pad to receive the discharges of labor; the latter is preferably made of oakum, or, if this cannot be secured, of a sterilized piece of blanket, and this covered with a layer of soft flannel.

(*e*) *Disinfection of the Instruments.*—Occasionally it will become necessary to employ other means of assistance than the attendant's hands: when this is the case all instruments so employed must undergo a process of thorough sterilization; the danger of sepsis increases with the number of instruments introduced into the vagina. ~~If of steel, they should be placed before using in a pitcher of boiling water and left there until required; if of hard rubber, a mercuric-chlorid solution (1 : 1000) or a solution of carbolic acid (5 per cent.) must be used.~~

(4) *The Examination.*—The object of the examination is to determine the position and presentation of the child, its condition, the progress of the labor, the size of the maternal pelvis, and the condition of the soft structures of the parturient canal. The examination should be made after thorough disinfection of the hands, and should consist first in palpation and auscultation of the abdomen, and, secondly, in a vaginal exploration. While palpating the abdomen the

patient should lie upon her back with the shoulders slightly elevated and the thighs partly flexed upon the abdomen (Fig. 74). The position for the vaginal examinations is known as the *obstetric*, *English*, or *left lateral recumbent* pos-

Fig. 74.—Dorsal posture.

ture; the patient lies upon the left side with the buttocks close to the edge of the bed and the limbs drawn up, the right slightly more than the left (Fig. 75). The examiner while exploring the vagina sits on a chair by the side of the bed with his face turned toward the patient's head. It is

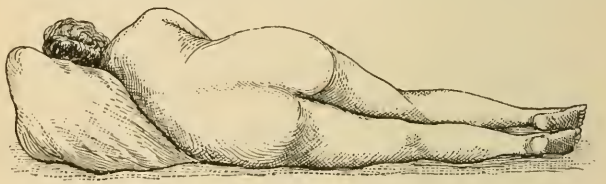

Fig. 75.—Left-lateral recumbent posture.

well in making the vaginal examination to keep the finger in contact with the membranes before and during one of the pains in order to ascertain the strength and effectiveness of the uterine contractions. During the process of examination a third person, preferably the nurse or the husband, should be present, not only for the satisfaction of the patient, but also for the protection of the physician. All other persons should be strictly forbidden the room during the progress of labor and for the first few days of the puerperium.

Management of Vertex Presentations.—First Stage.—In a perfectly normal presentation of the vertex there is but little to be done by the accoucheur. The patient's spirits should

be stimulated by words of encouragement, and her mind diverted from her condition as far as is possible. She should be permitted to walk around the room or sit in an easy-chair, and to occupy her time in reading or sewing, or doing nothing, as she prefers. A vaginal examination should be made not oftener than once in an hour or two, and while she is being prepared for this purpose the physician should pass into an adjoining room. When the dilatation of the os has progressed to 4 or 5 cm. (1.5745 to 1.9685 in.) the patient should be confined to her bed to avoid any risk of a precipitate expulsion of the fetus. The physician should see that the bowels are well emptied and that the urine has been properly voided. If the pains are rather severe and cause bitter complaining on the part of the patient, Playfair's treatment may be of service, especially in those cases in which there exists a considerable rigidity of the cervical and vaginal tissues: this consists in the administration of chloral hydrate in 15-grain doses repeated once or twice at intervals of from fifteen to thirty minutes. The chloral may also be given *per rectum* in 30-grain doses, suspended in mucilage of acacia or in milk and the white of an egg. It should not be used when there is grave organic heart-disease. This drug quiets the patient, induces drowsiness, regulates and strengthens the pains, and relaxes the soft structures of the parturient canal. Should this stage be protracted, the patient will require some nourishment; this may consist of a small amount of beef-tea, a cup of sherry, or a glass of milk, and a cracker or two. If the abdominal walls should be found to be relaxed, as is often the case in multiparæ, the effectiveness of the pains may be materially increased by the application of an abdominal support.

Second Stage.—(1) *Delivery of the Head.*—Labor having progressed until complete dilatation of the os has been effected, vaginal examinations should then be made every ten or fifteen minutes. If the membranes have not rup-

tured spontaneously by the time dilatation of the os is completed, it becomes the physician's duty, in the case of multiparæ only, to artificially cause their rupture. This may be accomplished preferably by the finger-nail or by a hair-pin or a match-stick, pressure being exerted upon the membranes while not tense as during the presence of a pain. Care must be observed that it is not the scalp or the attenuated lower uterine segment that is perforated in mistake for the smooth membranes. This can generally be decided by waiting for a pain, when, if it be the membranes covering the presenting part, they will be noticed to become tense and to bulge through the os to a greater or less extent; the scalp, on the contrary, during the height of a pain becomes corrugated, so that there should be no difficulty in recognizing it. Before the escape of the liquor amnii it is well to have the patient's garments well drawn up above her hips and secured there, in order to avoid soiling.

Preservation of the Perineum. — The pains now become straining in character, and during their presence the woman should be encouraged to bear down; she may also make traction upon a puller, so as to contribute to the uterine action the support of the abdominal muscles; this may be continued until the perineum becomes well distended, when all voluntary efforts should cease. The aim of the physician should then be to preserve the integrity of the perineum as far as it is possible for him to do so. The fourchet will be torn in over 60 per cent. of primiparæ, while there will occur a laceration of the perineum to a greater or less extent in about 35 per cent. of primiparæ and in 10 per cent. of multiparæ; extensive laceration of the perineum, however, and especially those tears involving the rectovaginal septum, are to a large degree avoidable. The common *causes of perineal laceration* are—(1) precipitate expulsion of the fetus; (2) large size of the fetal head or under-size of the vulvar outlet; (3) rigidity of the perineum; (4) faulty mechanism, as when there is failure of the

head to extend or when the head is expelled in an oblique diameter, as in case of contraction of the pubic arch; (5) improper management of the delivery of the shoulders. *Preventive Treatment of Laceration.*—Efforts directed toward the preservation of the maternal soft structures may be made as follows: (1) *Retardation of the Expulsion of the Head.*—This may be accomplished in the following ways: (*a*) By *Hohl's Method* (Fig. 76), which consists in applying resistance to the

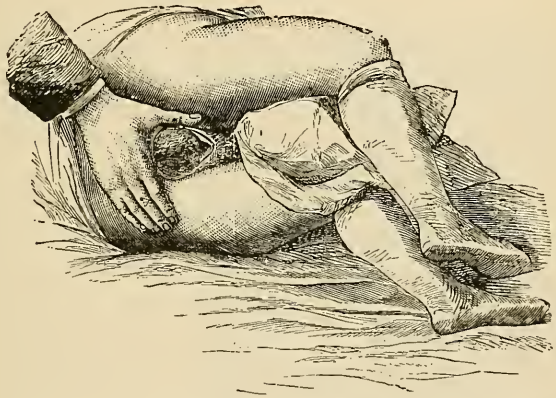

FIG. 76.—Hohl's method of preventing laceration of the perineum.

head by pressing the thumb against the occiput above and the index and middle fingers posteriorly against that portion of the head nearest the fourchet; in this way absolute control may be had over the advancing head. (*b*) By *Fasbender's Method.*—The patient resting upon her left side, the physician stands behind her and applies the index and middle fingers of the right hand to the occiput while he inserts the thumb as far up into the rectum as is possible. The movements of the head are thus under thorough control; during a pain it may be retarded, and in the interval it may be helped onward. (*c*) By *the use of the forceps,* which may be applied and the head held back during the height of a pain, and gently assisted downward in the intervals. (2)

Efforts at Effecting Perineal Relaxation.—(*a*) *Goodell's Method.*—The thumb of the left hand is pressed against the advancing occiput, while the middle and index fingers of the same hand are inserted into the rectum and caused to drag forward and upward the distended perineum during a pain. (*b*) *Playfair's Method.*—The thumb and forefinger of the right hand are placed on either side of the head upon the distended perineum, and the latter is gently pushed forward over the head during the pain. (*c*) *Merkerttschiantz's Method.*—*Bilateral Pressure.*—The patient resting in the dorsal position, the thumb and fingers of both hands are pressed against the distended perineum on both sides, and during a pain the tissues thus grasped are pushed toward the central line; as the head begins to emerge the left hand is placed above with the ulnar border in apposition with the mons veneris and the middle and index fingers about an inch from the thin border pressing the upper portion of the perineum toward the median line. (*d*) *The use of anæsthetics*, preferably ether. (*e*) *Episiotomy* (Fig. 77).—This operation consists in the making of a lateral incision of the vulva for the purpose of

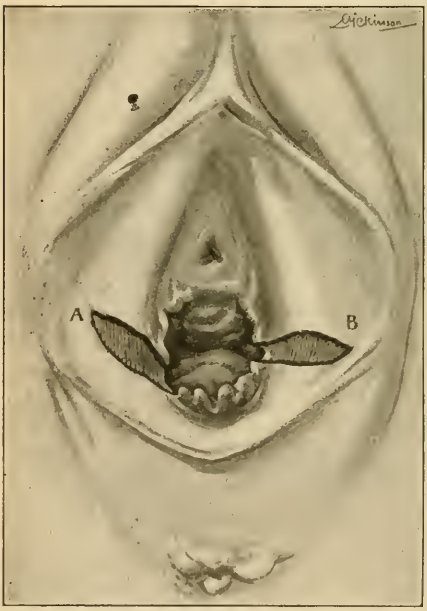

FIG. 77.—Double episiotomy (sketch, just after delivery, from nature, by R. L. Dickinson): A, direction of incision faulty, pointing toward the posterior vaginal wall; B, correct line of incision, running parallel with the axis of the vulvar opening.

relieving vulvar and perineal tension. During the height of a pain the incisions are made upon the mucosa just within the vulvar opening, about ½ an inch upon the vaginal walls; they should be from ½ to ¾ of an inch long, and not more than ¼ of an inch in depth, and should be closed immediately after labor. This operation is not recommended, as a simple laceration of the perineum involves less destruction of tissue than a laceration on either side of the vulva, and can be more readily repaired than the latter. (3) *Efforts at Elevating the Head.*—(*a*) *Ritgen's Method.*—The tips of the fingers of the right hand are placed upon the perineum back of the anus and close to the point of the coccyx, and pressure upward and forward is made between the pains upon the frontal bone of the fetal head. (*b*) *Olshausen's Method.*—*Rectal Expression.*—The index and middle fingers of the right hand are passed into the rectum and pushed through the rectovaginal septum into the mouth or beneath the chin of the child; between the pains the head is pressed upward and forward.

(2) *Delivery of the Shoulders.*—The head of the child having now passed through the vulvar orifice, and this occurring preferably after the pain has passed away, for a few moments there is a cessation of the uterine contractions. During this time it is the duty of the physician to support the head in the right hand, and at the same time to pass the fingers of the left hand over the neck in order to ascertain whether or not the cord is coiled around it: if it be found, it should be loosened as far as is possible, or, if there are two or three coils, it then becomes necessary to ligate the funis in two places and divide it between the ligatures, at the same time hastening the delivery of the body of the child by pressure upon the fundus of the uterus in order to stimulate the latter to contract. This pressure may best be made by an assistant, the physician devoting his energies for the time being to the care of the child. The vaginal secretions should be cleansed from the eyes and face, and

by the time this is accomplished the next pain, which is to deliver the shoulders, will probably occur. Should there be any delay at this stage of labor and the child seem to be in danger of death from rupture of a cerebral vessel, the head should be grasped by both hands placed on the lateral aspects and carried first down and backward toward the sacrum, then up again toward the symphysis, gentle outward traction being made, and finally down again; the anterior shoulder being extracted in this manner, the rest of the body is rapidly delivered. This method will generally answer; but should it not succeed, a finger should be passed through the posterior axilla and gentle traction made, the head being lifted and the assistant making friction over the fundus of the uterus. As the shoulders and body slip out of the vulvar orifice in quick succession, the hand of the assistant follows the contracting uterus to prevent relaxation and postpartum hemorrhage. Respiration is established, the child cries, the heart's action becomes regular, and in a few moments the cord ceases to beat.

(3) *Ligation of the Cord.*—The cord should be ligated only after the pulsations have entirely ceased; immediate ligation after birth is said to deprive the fetal circulation of at least three ounces of blood—a considerable loss in weak and anemic children. The most desirable ligature is a small-sized tape which will not cut through the structures of the cord. The ligation is made at a point about two inches from the umbilicus, and again about an inch farther from the navel, a surgeon's knot being employed for the proximal ligature (Fig. 78); the cord is then divided midway between the two ligatures, care being taken not to injure the child itself

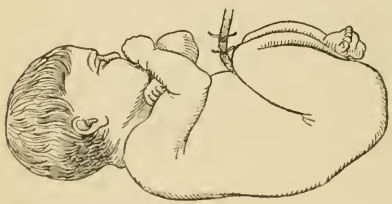

FIG. 78.—Fetus at term, showing method of tying the cord.

in the process. To avoid this danger it is best to cut the cord while it is held in the hollow of the hand, the dorsum of the hand being directed toward the child's abdomen. The object of the double ligation is manifold: in the first place, it prevents unnecessary soiling of the bed by arresting the escape of blood from the placenta during the time that must elapse between division of the cord and expulsion of the secundines; secondly, in case of twin-pregnancy, death of the second child from hemorrhage is prevented. The cord being severed and the non-existence of a twin-pregnancy being assured, the second ligature may be removed and the free blood contained within the placental tissue be allowed to drain into a vessel; the bulk of the placenta is thereby considerably lessened and its early and easy expulsion from the uterus and vagina facilitated. Nguyen Khac Can[1] makes the ingenious suggestion that the rapid diminution in the size of the placenta, due to the free escape of the intraplacental blood, favors retroplacental hemorrhage and consequent complete separation of the placenta. While this suggestion has not been confirmed by further observation, it is interesting to note that out of 68 cases of labor in Can's care, in which double ligature of the cord was practised, there were 4 cases of adherence of the placenta, while in 146 cases with single ligature there occurred but 2 cases of adherent placenta. The duration of the third stage of labor is also considerably lessened when but a single ligature is applied to the cord.

In case of unusual thickness of the cord, due to the presence of an excessive amount of Wharton's jelly, *stripping* may be indicated. This consists in placing the first or placental ligature, and then in severing the cord on the umbilical side of the ligature, the cord being held firmly at the umbilicus between the thumb and the index finger. This grasp being maintained, the excess of jelly is squeezed out of the end of the funis by pressure with the

[1] *Boston Med. and Surg. Jour.*, March 1, 1894.

fingers of the other hand, and a second ligature is then placed near the extremity of the cord. The object of this process is to favor rapid desiccation. *Stephen's Method.—Laceration of the Cord.*—This method consists in wrapping the cord around the index finger of each hand and tearing it asunder; the vessels retract beneath the torn edges and hemorrhage does not follow. We cannot see that this method is in any respect superior to that generally employed.

(4) *The Use of Anesthetics.*—Occasionally in the second stage of labor, owing to the severity of the pains or to the hypersensitiveness of the patient, or in order to avoid severe perineal laceration or to arrest eclamptic seizures, the use of an anesthetic is required. Either chloroform or ether may be employed, but preferably the latter save in puerperal eclampsia. Proper precautions must be observed in the use of the anesthetic, and grave cardiac or pulmonary affections will be an absolute contraindication to its administration. The method of administering the anesthetic varies somewhat from that employed in an ordinary surgical operation. The most acceptable mode consists in laying a towel over the mouth and nose and pouring upon it, when the pain is coming on, three or four drops of ether or one or two drops of chloroform at each respiration. This will suffice to dull the pain; the anesthetic may be withdrawn during the intervals. *Advantages of an Anesthetic.*—It cannot be denied that certain advantages attend the use of the anesthetic. Thus, (1) it greatly diminishes the intensity of the patient's suffering; (2) it relaxes the soft structures, and facilitates in this way expulsion of the child. There are to be noted, however, certain *disadvantages*, as follows: (1) It diminishes the efficiency of the uterine contractions to an appreciable extent; (2) if administered in too large quantity, it is followed by the usual after-effects—nausea, vomiting, and headache; (3) it predisposes to postpartum hemorrhage from non-contraction of the uterus.

Bedford Brown of Alexandria, Va., has employed chloroform in over fifteen hundred cases of labor without any ill results. It is very evident that pregnant and parturient women show a remarkable immunity to the toxic action of chloroform, and Brown claims that its employment is justifiable in every case in which, in the second stage of labor, the woman shows any tendency to nerve-exhaustion.

Management of Pelvic Presentations.—(*a*) *Before Labor.*—On account of the high fetal mortality—30 per cent.—attendant upon presentation of the pelvic extremity it is advisable in every case in which the diagnosis of breech presentation is made prior to the onset of labor to attempt to convert the presentation into that of the cephalic extremity by means of external bimanual manipulation. The proper performance of this maneuver requires experience on the part of the operator, the presence of a sufficient amount of liquor amnii, and the absence of excessive irritability of the abdominal and uterine muscles. If it cannot be accomplished or if the case be seen after labor has begun, the treatment then consists in a careful supervision of the normal mechanism of the presentation. (*b*) *First Stage of Labor.*—Absolute inaction on the part of the accoucheur, other than a close watch over the progress of the case, is all that is required during the process of uterine dilatation. Particular care must be taken to preserve the membranes as long as possible, even until their appearance at the vulvar outlet, since they serve as a better dilator than does the soft breech, and by their presence the uterus is stimulated to more powerful contraction. (*c*) *Second Stage of Labor.*—The inaction observed during the first stage of the mechanism should continue until the breech has passed through the vulvar orifice; care must be taken at that time to guard the perineum as in ordinary vertex presentations. The patient should be brought to the edge of the bed and made to assume the dorsal decubitus as soon as the breech has begun to distend the vulva, and every arrangement

must be made to facilitate the birth of the upper portion of the trunk and the head. As the breech is expelled it is supported by the hands of the physician, while an assistant makes gentle pressure upon the fundus uteri; no traction should be made, in order that the normal relationship of the arms to the thorax shall not be disturbed. The cord will appear as soon as the umbilicus of the child emerges from the parturient canal, and attention must at once be directed to it; if the pulsations be normal, the funis should be placed in the angle corresponding to the sacroiliac synchondrosis of the diameter opposite to that occupied by the fetal head, where it will be least impinged upon. There are now but a few minutes in which to deliver the child to avoid asphyxiation. Firm pressure must be exerted upon the fundus uteri, and the woman should be encouraged to bear down; the body of the child must be supported, and even lifted somewhat, in order to favor descent and delivery of the posterior shoulder. If traction has not been made, the arms will slip out flexed upon the chest and the shoulders will emerge; the body of the child will now occupy a transverse position, with the abdomen directed downward. *Delivery of the After-coming Head.*—Pulsations in the cord now probably cease from compression of the funis above against the pelvic wall by the advancing head, and fetal life cannot be maintained under these circumstances for a period longer than five minutes. Immediate delivery must therefore be accomplished through manual efforts on the part of the physician himself. There are various methods by which the after-coming head may be delivered. These, in the order of their application, are as follows: (1) *The Wiegand-Martin Method.*—The child is laid astride the left arm, while the fingers of the corresponding hand are introduced into the vagina beneath the fetal body; the index finger of this hand is passed into the child's mouth, and gentle traction is made in order to secure and maintain complete flexion of the head (Fig. 79).

The fingers of the right hand are then placed upon the occiput through the abdominal walls just above the symphysis pubis, and by combined pressure above (backward, downward, and forward) and traction below the head is delivered;

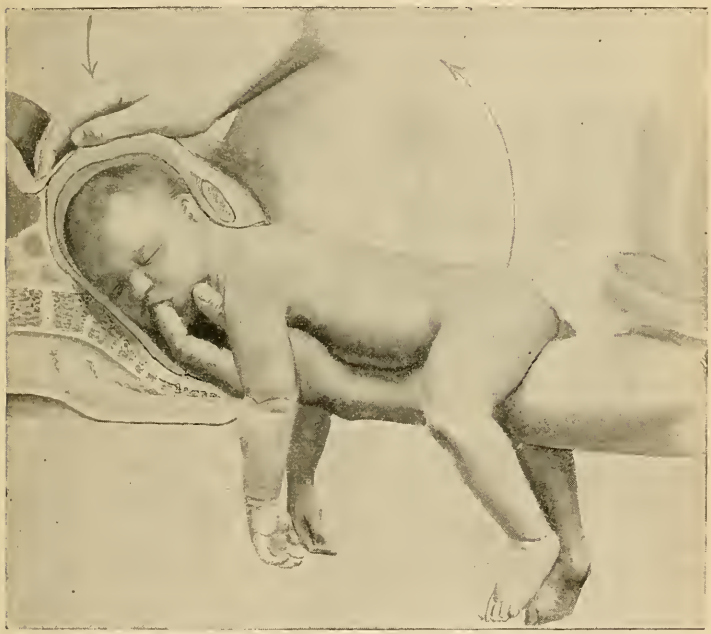

FIG. 79.—Delivery of the after-coming head by flexion through seizure of lower jaw, and extrusion by means of pressure in axis of brim (Dickinson).

as it emerges from the vulvar orifice the left arm should be elevated, so that the fetal back is directed toward the mother's abdomen; this movement prevents undue distention, with laceration, of the perineum. (2) *The Mauriceau or Veit-Smellie Method.*—This is the same as the preceding as regards the disposal of the left hand. Instead, however, of indirect pressure upon the fetal head through the abdominal wall, the fingers of the right hand are passed into the vagina above the child, the middle finger extending up the

Teach Smellie-Veit as

neck until the external occipital protuberance is felt, upon which direct pressure is exerted; the index and ring fingers grasp the clavicles, and traction is made by both hands downward, outward, and upward, following the course of the parturient canal. If it be desired, an assistant may aid in this movement by suprapubic pressure upon the descending head. (3) *The Prague Method* (Fig. 80), also called

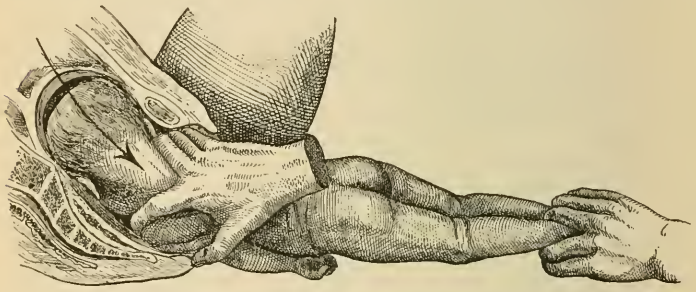

Fig. 80.—Prague method of extracting the after-coming head, superior strait (Dickinson).

Pugh's Method.—The right hand firmly grasps the child's ankles, the heels fitting into the palm of the hand, the middle finger just above the internal malleoli, and the index and ring fingers above the external malleoli; the index finger of the left hand is then passed over the right clavicle from above, and the remaining fingers of this hand over the left clavicle, and combined traction with the two hands is made downward and outward until the head well distends the perineum; the right hand now grasps the legs just below the knees in the same manner as before, the toes, however, resting upon the back of the hand; with this hand the body is forcibly lifted upward and carried over the mother's abdomen, toward which the back of the child is directed, while the left hand remains firmly fixed at the symphysis as a fulcrum beneath which the head rotates on its outward way over the perineum. Unless this maneuver be performed with great care the fetal neck may be dislocated or fractured, or the child even be

decapitated. (4) *The Deventer Method* (Fig. 81).—This method should be employed only in cases in which very rapid delivery is required and in which no pelvic or other deformity exists. The mother being placed with the hips extending well beyond the edge of the bed, the child is grasped as in the Prague method, and is carried downward

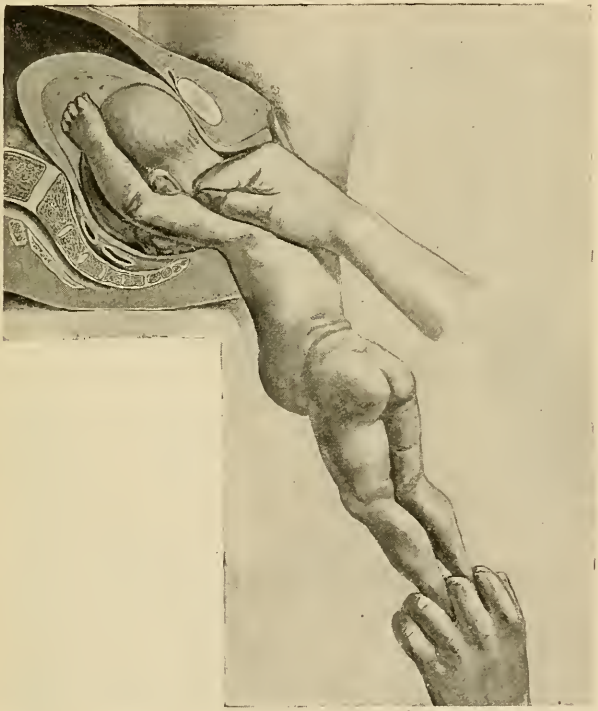

FIG. 81.—Deventer's method of extraction of the after-coming head and arms (Dickinson).

and backward beneath the mother's buttocks and toward her shoulders. No attention is paid to the arms in this method of extraction ; that is, if they become extended along the sides of the head, they are allowed to remain there and are not delivered before the head. It is claimed that the perineum is never ruptured by this method, but rather is

relaxed and sweeps backward over the advancing face. (5) *The Use of the Forceps.*—This is a very valuable and rapid method of delivering the after-coming head. The best instrument for the purpose is the axis-traction forceps. The body and limbs of the child are grasped by an assistant and carried upward over the mother's abdomen; the blades are applied to the sides of the head, and delivery is effected as in ordinary forceps operations. (6) *Pulvermacher's Method.*—J. Pulvermacher of Breslau[1] has called attention to the fact that in many cases of breech presentation the fetal head is found in such a position that the occiput, resting partly or wholly upon the pelvic wall, is bent at an angle to the neck, so that the finger can only detect an ear and the presenting part of the cheek or the zygoma; the other facial features —the brow, eyes, nose, mouth, and chin—cannot be felt. Under these circumstances the other methods of extraction are not satisfactory, and Pulvermacher recommends the following procedure: A dull double hook is guided by the hand to the region of the zygoma, somewhat beneath the infraorbital margin, and the blunt end of the instrument, which is hook-shaped, is, with the vaginal hand, firmly pressed against the head, while on the other hook-shaped end, which projects from the vulva, firm traction is maintained by the other hand. The nurse or assistant at the same time makes downward traction with one hand upon the fetal limbs, and with the other hand presses through the abdominal walls upon the head. The face turns immediately toward the sacral hollow, and rapid delivery can be effected. The hook is said to inflict no injury upon the fetal face.

(*d*) *Management of the Third Stage of Labor.*—(1.) *The Securing of Uterine Contraction.*—Firm contraction of the uterine muscle is best ensured by immediately grasping the fundus of the uterus; under this stimulus it is felt to contract firmly and to become hard and rigid; care must be observed not to do this with any over-amount of force or

[1] *Centralblatt für Gynäk.*, No. 29, 1894.

roughness, for the woman is very sensitive to the slightest interference and will complain bitterly during the manipulations. Contraction being secured, the cord is ligated and the child removed. (2) *Expulsion of the Placenta.*—After a period of varying duration, generally from fifteen to twenty minutes, the pains return and the placenta is voluntarily

FIG. 82.—Credé's method of expressing the placenta, showing also episiotomy incisions (photographed from nature).

expelled in the vast majority of cases. This should be accomplished without any traction whatever being made upon the cord. During the few minutes of quiescence a process of coagulation has been going on in the uterine sinuses—another of nature's measures to prevent post-

partum hemorrhage; hence may be seen the advantage to be derived from not making undue haste in emptying the uterine cavity. At the expiration of this time, if the placenta has not appeared, *Credé's method of expression* (Fig. 82), also known as the *Dublin*, or *Kristeller's method*, may be employed. This consists in applying gentle rotatory friction to the fundus uteri until it is felt to harden under the influence of a uterine contraction; the fundus is then grasped by the hand and compressed, while at the same time pressure is made downward and backward in the line of the axis of the parturient canal; the placenta will be driven out of the uterine cavity through the vagina and expelled. If this method of expression be properly applied, failure of expulsion will be exceptional. (3) *Removal of the Membranes.*—The placenta should be grasped by the right hand as it is emerging from the vulvar orifice, and gentle traction in the direction of the sacrum made upon it and the after-coming membranes. This maneuver prevents tearing of the delicate membranes and renders their removal an easy matter. During this process the left hand has been following down the contracting uterus in order to prevent relaxation. A method that is largely in vogue, but which is not thoroughly satisfactory in its results, consists in rotating the placenta upon its axis so as to twist the after-coming membranes into a cord-like structure; not infrequently this very procedure results in laceration of the membranes, with retention of fragments thereof within the genital tract. An inspection should be made of the secundines to ascertain that no portion has been left behind: if some of the membranes be missing, renewed efforts at expression will probably secure complete expulsion. Labor is now completed and the puerperal period is initiated.

VII. THE PUERPERIUM.—LACTATION.

THE *puerperium*, also known as the *puerperal period*, *state*, or *season*, or the *lying-in period*, is that interval commencing at the time of the delivery of the secundines and continuing until the uterus has regained its normal size of 7⅝ cm. (3.0018 in.), external measurement; this period generally covers about six weeks. It is characterized by a series of phenomena that shall now come under consideration.

Physiology of the Puerperium.—The changes that take place in the woman's body after the accomplishment of parturition are as complex and astounding in their immensity as are those that are noted as taking place during the period of gestation. They are even more rapid in their occurrence, for in from six to eight weeks is destroyed that which required ten lunar months to perfect, and this rapid transformation without marked accompanying systemic manifestations is one of the most marvellous phenomena of nature. It is fitting that some knowledge of these changes be entertained in order that the necessity for a strict concurrence in the following rules for the proper management of the puerperal woman be appreciated.

CHANGES IN THE GENITALIA.—*Involution.*—By *involution*, as applied to the uterus, is meant the retrogressive change undergone by that organ after parturition by which it returns to its normal weight and condition. An idea of the immensity of this process may be had when it is stated that at the time of delivery the uterus weighs almost two pounds and measures about 30½ cm. (12.0078 in.) in length, 23 cm. (9.0531 in.) in breadth, and 21½ cm. (8.46455 in.) in thickness; at the end of the puerperium it should be reduced to its original weight of two ounces, and should measure but 7⅝ cm. (3.0018 in.) in length. This great reduction in size is brought about by a process of rapid fatty degeneration, the immensely hypertrophied uterine tissue breaking down under the diminished nutritive supply and undergoing an

acute fatty change, the débris being carried off by the rich lymphatic tissue of the pelvis.

By careful daily palpation of the abdomen a close watch may be kept over the diminishing uterus, and the progress of involution may thus be noted. From observations made by various obstetricians upon large numbers of puerperal women the following measurements during the successive days of the puerperium may be taken as approximately correct: *First day*, the fundus extends one finger's breadth above the umbilicus; *second day*, it is at a level with the umbilicus; *third and fourth days*, it is one finger's breadth below the umbilicus; *fifth and sixth days*, it is two fingers' breadth below the umbilicus; *seventh and eighth days*, it is three or four fingers' breadth above the symphysis pubis; *from the ninth to the twelfth days, inclusive*, it is slightly above, at, or slightly below the symphysis pubis. From this time on, palpation no longer being available, intrauterine measurements may be employed if a knowledge of the actual size of the uterus be required. The following average intrauterine measurements (Norris) will be of service in estimating the progress of involution in any given case: *Tenth day*, $10\frac{1}{2}$ cm. (4.13385 in.); *fifteenth day*, $9\frac{9}{10}$ cm. (3.89763 in.); *third week*, $8\frac{8}{10}$ cm. (3.46456 in.); *fourth week*, 8 cm. (3.1496 in.); *fifth week*, $7\frac{1}{2}$ cm. (2.95275 in.); *sixth week*, $7\frac{1}{10}$ cm. (2.79517 in.); *seventh week*, 7 cm. (2.7059 in., the normal measurement of the non-pregnant uterus); *eighth week*, $6\frac{7}{10}$ cm. (2.63779 in.); *from the tenth to the twelfth week*, $6\frac{1}{2}$ cm. (2.5590 in.). As may be noted by referring to the foregoing figures, it has been found that at the close of involution there frequently follows a physiologic superinvolution, which, however, disappears as the normal condition of the pelvic circulation is restored.

Coincident with these changes in the uterine muscle are similar changes in the hypertrophied uterine mucosa—the decidua. The decidual cells undergo a rapid fatty metamorphosis, and, exfoliating, are discharged in the lochia;

by this process the entire mucosa is shed piecemeal, while between the more deeply situated decidual cells are developed vascular outshoots that unite to form new venous channels through the raw tissue. Diapedesis occurs, and the escaped leukocytes unite to form a delicate granulation-tissue which within a short space of time develops into a new endometrium. There is thus brought about simultaneously a discharge of the hypertrophied decidual tissue and the formation of a new uterine mucosa, the entire change occupying the short space of from six to eight weeks.

At the placental site other interesting and important changes are taking place. Here it is that all the large uterine sinuses have centered during the period of gestation, and here it is that rapid changes must take place before, during, and after parturition, or the woman lose her life from postpartum hemorrhage. It will be remembered that during the last weeks of gestation a stagnation of the pelvic circulation takes place, whereby is produced a greater tendency to the formation of coagula in the widely-dilated venous channels. As the placenta is torn loose by the uterine contraction, there occurs an immediate retraction of the thin vessel-walls, and at the same time their caliber is entirely obliterated by the violent pressure exerted by the contracting muscular fibers. Small coagula form in and about the mouths, and, undergoing a process of organization into connective tissue, the venous sinuses gradually entirely disappear.

The *cervix* participates in the retrograde process: at first it is soft and patulous, so that the finger may be introduced within the internal os even until the end of the first week. The canal gradually closes, however, and by the termination of the puerperium it has regained its normal condition. The external os is more or less distorted and lacerated, and never acquires its original virginal condition.

Involution of the Vagina.—A similar process takes place

in the hypertrophied vaginal tissues. The walls, which have been notably relaxed and pendulous, largely regain their tonicity and normal dimensions. The characteristic rugous condition of the virginal vagina, however, does not return after parturition.

The *vulva* immediately after labor is swollen and tender to the touch as a result of the severe contusions and over-distention. Within a few days, however, it again assumes a normal appearance.

Changes in the General System.—(*a*) *The Blood and the Circulation.*—Immediately after labor the hyperinosis that had persisted throughout pregnancy is somewhat increased for the time being, in consequence of the remarkable degenerative processes that are going on in the body; gradually, however, the blood loses its excess of fibrin and watery constituents and approaches its normal condition. This process of involution, as it may be termed, may be promoted by the judicious administration of tonics, especially the ferruginous salts, and by proper attention to nourishment and to the hygienic conditions. The alteration in the heart itself—the hypertrophy with dilatation—corrects itself as the arterial tension falls. In proportion as the tension diminishes the rapidity of the pulse lessens, although the heart is for some time in an irritable condition, and may be excited to great rapidity of action by the most trivial of causes. The low degree to which the pulse-beat may sink immediately after labor is occasionally very striking: the heart has been known to make less than forty pulsations to the minute, although the average pulse-rate after labor may be placed at from sixty to seventy beats per minute.

(*b*) *The Temperature.*—There is usually a slight rise of temperature immediately subsequent to labor—about a degree or a degree and a half; after that time the temperature should not rise above 100° F. The nurse must be instructed to take the morning, noon, and evening tem-

peratures and to keep an accurate record of the same. The slight elevation that is normally present is dependent upon the exhaustion consequent upon labor, the constipation, the insignificant traumatisms that may be present, and the commencement of lactation.

(*c*) *The Secretions and Excretions.*—The excessive production in the body of effete material throws upon the emunctory organs a vastly increased amount of work: as an inevitable consequence all the excretions of the body are notably augmented, and puerperal autoinfection is thereby prevented.

The Urine.—The total quantity of urine voided is much in excess of the normal, but the change consists mainly in an increase in its aqueous constituents, while the solid materials, with the one exception of the chlorids, are below the normal. Various abnormal constituents may be temporarily present, such as peptone, indicating the metamorphotic processes going on in the body, and lactose in varying amounts, due to absorption of the excess of sugar stored up within the breast. An important condition requiring close attention during the first few days subsequent to labor is the difficulty of micturition that is experienced by many patients. This may result from several conditions: (1) There may be a temporary closure of the urethra from edema and distortion due to prolonged pressure by the fetal presenting part; (2) there is an increased capacity of the bladder following the removal of the pressure exerted by the gravid uterus (Schroeder), and as a consequence there is not so great stimulation to an evacuation of its contents; (3) the relaxed abdominal walls cannot exert the usual expulsive efforts and thus aid in the discharge of the urine; (4) the bladder-walls may be temporarily paralyzed, so that contraction is impossible; (5) there may be a strong neurotic or hysteric element in the patient's constitution. In cases in which this complication exists a safe rule to follow is inaction for at least twelve hours, other

than the application of hot fomentations to the hypogastrium and the internal administration of small doses—from 15 to 20 drops—of the fluid extract of ergot; a change to the sitting posture may, by bringing the abdominal muscles into action, result in expulsion of the vesical contents. In some instances the sound of running water may induce urethral relaxation. If these efforts fail, at the expiration of twelve hours an absolutely clean soft-rubber catheter should be introduced, after cleansing the meatus by a mild mercuric-chlorid solution, and the bladder evacuated; if necessary, this may be done twice or thrice daily until voluntary action is restored, strict care being observed not to set up that deplorable sequela, cystitis. A constant dribbling of urine after a prolonged labor should excite suspicion as to the existence of a urinary fistula or of an incontinence of urine due to an over-distention of the bladder — the so-called *incontinence of retention.* Very rarely, not more than once in two thousand cases, there may exist a paralysis of the urethra giving rise to the incontinence.

The Bowels.—These are generally inactive. Nothing should be done, unless there be urgent indications, such as pain and tympanites, until the evening of the second or third day. At that time a gentle laxative, such as Hunyadi water (a wine-glassful), citrate of magnesia, a small amount of compound licorice powder, or a prepared dose of castor-oil, may be administered. The bowels once patulous, this condition should be maintained by the exhibition of laxative foods or remedies or by enemata.

The Skin.—This is moist, indicating a relaxed condition of its glandular elements. The perspiration may become profuse, and enough be lost to saturate the clothing of the patient and even the mattress. As a consequence of this relaxed condition the patient is very susceptible to the action of draughts, and special precautions are necessary to avoid exposure to cold. The increased perspiration occa-

sions a corresponding increase of thirst, which may become excessive.

The Respiratory System.—An examination of the expired air shows an excess of carbonic-acid gas and other effete products derived from the vitiated blood.

Management of the Puerperium.—(1) *The Conditions Subsequent to Labor.*—Immediately subsequent to the termination of labor the mother generally lies in a state of contentment. The sudden ending of her sufferings is followed by a period of reaction in which there is no inclination to any exertion on her part; this is termed the *post-partum shock.* She may lie with closed eyes or she may take but a languid interest in what is going on around her. Occasionally, however, she may be seized shortly after delivery with a severe nervous chill, the so-called *post-partum chill,* which may persist for some minutes, but is of no pathologic significance. During its continuance the woman should be protected by a little extra covering, and if it be very protracted she should be cleansed and made comfortable as quickly as possible.

(2) *The After-treatment.*—Directly after the expulsion of the placenta in normal cases the first and only vaginal douche should be given to remove whatever clots or shreds of membrane may have been retained: it should consist of a pint or more of a 2 per cent. solution of creolin, and as a precautionary measure this should be administered through glass vessels, the nozzle itself being glass with lateral, and not terminal, perforations. As soon as it is given the soiled pads upon which the discharges of labor have been received should be removed, together with the sheet and rubber blanket. Permanent uterine contraction may be secured by the internal administration of a dram of the fluid extract of ergot or the fluid extract of ustilago—a time-honored but generally unnecessary custom—and the application of a uterine pad and an abdominal binder. The *pad* should be placed just above the umbilicus, so as to exert pressure

upon the fundus uteri. The *binder* (Fig. 83) should consist of a strip of unbleached muslin, canton flannel, or dense gauze cut straight, and should be about a yard and a half long, so as to well encompass the body, and a foot

FIG. 83.—Abdominal binder and breast-binder in place (Dickinson, from a photograph).

wide; it may be secured by safety-pins or may be prepared as a many-tailed bandage. It should extend from the hips upward to and including the pad, and reaching to the lower border of the mammary glands, and should be drawn as tightly as is consistent with the woman's comfort. The hips and chest must be grasped firmly, and the entire abdomen must be compressed moderately and equally, but not tightly; the binder should be rather loose over the epigastrium. In fastening the binder the first pin should be inserted at the lowest portion, and others should be placed at intervals, from below upward, of from one to two inches. Upward slipping may be prevented by passing a broad band of the muslin or gauze around

each thigh and pinning these to the bandage over the trochanters. It becomes the duty of the nurse to tighten the binder daily, so as to follow the uterus as it sinks into the pelvis. The binder must be worn for at least six weeks, and preferably three months. By its support dislocation of the uterus is prevented. The relaxed pelvic articulations are supported and their complete union is promoted, and relaxation of the pelvic circulation is prevented. The firm tonic contraction of the uterus induced by its presence favors involution and minimizes the danger of after-pains, postpartum hemorrhage, and septic infection.

For at least one hour after the birth of the child the physician should remain in the patient's house, though not necessarily in the lying-in room. At the expiration of this time the patient should be resting quietly with a normal pulse of from seventy to eighty beats per minute, a soft, moist skin, and a firmly-contracted uterus. A valuable suggestion to bear in mind is that known as *McClintock's rule*—namely, that a pulse of one hundred or more beats per minute indicates an impending postpartum hemorrhage: such a condition being present, the physician should under no circumstance leave his patient's side until the normal pulse-rate has been attained. The room should be kept dark and all disturbance forbidden; no visitors are to be allowed.

(3) *The Perineum.*—The patient having been attended to, it should be the last duty of the physician before leaving her to make a careful inspection of the vagina and perineum in order that he may detect any extensive contusions or lacerations that may be present. If a rupture of the perineum be found to exist to any extent beyond a mere tear of the fourchet, it should generally be closed at once under antiseptic precautions; an anesthetic, other than cocain locally, will not be required for this operation. If it be but a slight laceration or if there be merely slight contusions of the soft structures, the parts should be well cleansed and a

vaginal suppository of from thirty to sixty grains of iodoform should be introduced. Severe laceration may be repaired at any time within the first twenty-four hours.

(4) *The Protective Dressing.*—This, which is in nature essentially an antiseptic precaution, consists of three portions: (*a*) The bed-pads; (*b*) the lochial guards or vulvar pads; (*c*) the occlusive dressing (Hirst).

The Bed-pads.—These are antiseptic pads used to protect the bed-clothing during and after parturition. They should be one yard square, and may be made of a sterilized covering (either nursery-cloth or cheese-cloth), with a padding of cotton-batting, wood-wool, or jute; the padding should be sterilized by thorough baking in an oven. The advantage of such pads is their extreme cheapness, so that when soiled they may be destroyed and new ones used without much additional expense. Such a pad should be placed under the patient's hips and should be changed frequently. Beneath the pad is the *draw-sheet—i. e.* a sheet folded to four thicknesses and intended to serve as an additional protection to the bed. It is changed whenever soiled.

The Lochial Guards or Vulvar Pads.—These are small squares of some sterilized material—preferably carbolized gauze—with a padding of salicylated cotton (Hirst): by these materials the sanguinolent discharges are absolutely sterilized, while at the same time clotting is avoided; these pads also have a much less irritating effect upon the skin than when made of sublimated gauze. A pad of this description should be placed directly over the vulva after the discharges have been removed, and it should be changed as soon as soiled: during the first few days of the puerperium a change may be required as often as half a dozen times in the day; after the fourth and until the tenth day every six to eight hours will be sufficient. At each dressing the genitalia should be bathed in a weak mercuric-chlorid solution (1 : 2000 to 1 : 4000). The patient must not be disturbed while this is done; a bed-pan should be

slipped under her, and in this way the water may be prevented from soiling the bed and clothing.

The Occlusive Dressing (Hirst).—This is an outer protective dressing to be placed over the vulvar pad for the purpose of preventing the entrance of germs from the atmosphere and at the same time to further disinfect the vaginal discharges. It consists of a long narrow pad of carbolized gauze with a cotton-batting padding. It should be renewed whenever the vulvar pad is changed, and the soiled one should be destroyed.

(5) *The Visits.*—The first visit after confinement is to be made at about the expiration of twelve hours; after that for one week one visit daily will be sufficient, and once every second day during the remainder of the lying-in period. The object of the visit is to ascertain the condition of the patient and child and to give directions for the further management of the case. *Order of Examination.*—It is well to follow a routine practice in making the examination of the patient at these visits. The following order would suggest itself as the proper one to observe, that the accoucheur may be assured that no point in the management of his case has been neglected: In the first place, he should note the condition of the pulse; he should then mark the temperature and examine the temperature-chart that has been kept during his absence; the amount and condition of the lochia are next to be ascertained, and the last vulvar pad—which has been kept for this purpose—should be examined; the presence or absence of pain must be noted, and gentle pressure should be made over the lower portion of the abdomen to detect any tenderness that may be present, and which when found is indicative of beginning inflammatory processes; the urination should be inquired after, and the condition of the bowels noted; finally the breasts and nipples should be examined. The patient's condition having been found satisfactory, attention must next be directed to the child: inquiry should be made as to

its urination and defecation; if it be a male, phimosis must be looked for; the umbilicus must be examined for signs of inflammation or hemorrhage. The nurse should be directed to maintain absolute cleanliness in the room and about the patient; the latter's face and hands should be bathed and her hair combed each morning. The room should be kept moderately warm, and ventilation should be carefully attended to.

(6) *The Regimen.*—The appetite of the puerperal woman is generally indifferent: this may be accounted for by the fact that the accumulation of fat that has taken place in the body during the progress of gestation is now being absorbed, as is also the immensely hypertrophied uterine tissue. It is in this way that nature sustains the woman during the first few days of the puerperium. It is wiser while this process is going on to administer a light and easily digested diet, thereby avoiding gastrointestinal disturbance. In consequence of this lack of ingestion of new material there is generally during this period a steady loss of weight to the extent on an average of from one-eighth to one-thirteenth of the entire body-weight. The following diet with slight modifications has been suggested by eminent obstetricians: *The first two days:* Milk (from 1½ to 2 pints per diem), gruel, mutton-broth or chicken-broth, toast and butter; but one cup of tea in the day. Nourishment should be taken every three or four hours. *Third and fourth days:* Milk-toast, bouillon, poached eggs, porridge, soup, corn-starch, tapioca, wine-jelly, blanc-mange, stewed fruits, cup-custard, beef-tea, small raw oysters, one cup of coffee or tea *per diem. Sixth day:* In addition to the foregoing may be taken sweet-bread, white meat of fowl, squabs, tender steak, lamb chops, and mashed potatoes. *After the sixth day* the ordinary diet may be cautiously resumed. It is well to include in the diet at this time a large amount of milk, and, if desired, a wineglassful of extract of malt with each meal. Nursing

women should avoid all indigestible meats, ~~cocoa, chocolate~~, made dishes, gravies, rich desserts, pastries, coffee and stimulants in excess, and acid fruits. The question of diet should be largely governed by the patient's appetite and desires.

(7) *The After-pains.*—These are irregular and painful contractions of the uterus produced by efforts on the part of that organ to expel clots or shreds of membrane or to attain its normal proportions. They indicate a partial relaxation of the uterine tissue, and are most common in multiparæ; in fact, they are rarely noted after the first labor, and as a rule do not occur after the third or fourth day of the puerperium. The view that they are pathologic in nature is erroneous. They may be increased in intensity by any irritation of the nipples, as when the infant is applied to the breast. They may be distinguished from the pains of beginning pelvic inflammation by attention to the following points:

After-pains.	*Pain of Pelvic Inflammation.*
Pains are intermittent and cramp-like.	Pain is constant, acute, and localized to the point of inflammation.
Are relieved by pressure.	Is increased by pressure.
The pulse is normal.	The pulse is accelerated.
There is no effect upon the temperature.	Is attended by a rise of temperature.
Pains are usually followed by the discharge of clots or of an increased amount of lochia.	Is usually associated with either a diminution or a complete suppression of the lochial discharge.
The uterus may be felt to harden during the pains.	The uterus does not contract, but, on the contrary, is soft and flabby.

Treatment.—The administration of small amounts of opiates (for example, a Dover's powder; the acetate of morphin, ¼ grain every three or four hours; or a mixture of paregoric, 1 dram, and the fluid extract of ergot, ½ dram, every two or three hours) will generally control the pains. A sedative poultice containing laudanum may be applied over the uterus, or the abdomen may be rubbed with chloroform-and-belladonna liniment. Phenacetin, from 5 to 10 grains, or chloral hydrate, in from 15- to 20-grain doses, may give relief; quinin, 10 grains, in combination with from

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Codeine good

10 to 15 minims of hydrobromic acid, may be administered twice daily. Very severe pains may be arrested by inhalations of nitrate of amyl.

(8) *The Lochia.*—This is the name given to the discharge from the genital organs during the two to four weeks succeeding labor. This discharge varies in appearance and composition from day to day. Thus, during the first four days, when it is termed the *lochia rubra* or *cruenta*, it is mainly composed of free blood or blood-clots, together with a small amount of cervical and vaginal epithelium and some decidual débris; its color is bright red and it is quite profuse in amount. According to Gassner, the amount lost during this period is about 2¼ pounds. From the fifth to the ninth day, inclusive, it is termed the *lochia serosa* or "*green waters.*" It is now largely serous in composition, with a few red blood-cells and pus-corpuscles, more decidual débris, and some leukocytes, fat-globules, and mucin. Its color varies from pale red to a greenish tint; the amount is somewhat diminished, probably a pound being lost during this period. After the ninth day it is termed the *lochia alba* or *lactia.* This is mainly healthy pus at first, and later the normal mucous leukorrhea; its color is a grayish-white or a pale greenish-yellow, and its consistence is that of cream. It contains pus-corpuscles, leukocytes, cholesterin-crystals, fat-granules, and epithelial cells. There are present the germs that normally exist in the vagina—the long bacilli of Döderlein, whose function, it is believed, is to manufacture lactic acid, thus producing an acid environment that is destructive to poisonous germs: in this way puerperal sepsis may largely be prevented. The odor of the lochia is characteristic, peculiar, heavy, mawkish, and slightly offensive, but not putrid. The *danger signs* connected with the lochia are—(1) A putrid odor; (2) marked diminution or suppression. When these signs are present beginning septicemia should be feared. The quantity of the discharge may be estimated by an examination of the napkins and by keep-

ing a record of the number soiled; normally, for the first day there should be from six to eight changes; from the second to the fifth day, inclusive, three *per diem;* and after the fifth day, two daily.

(9) *The Lying-in Period.—The "Getting-up."*—For the first week of the puerperium the patient should occupy the dorsal position, and for the first six or eight hours, according to the severity of the labor, she should not be permitted a pillow; by observing these precautions sudden syncope may be avoided. The bed-pan must be employed as required, and for this purpose the patient must be propped up by an extra pillow or two. During this prolonged dorsal decubitus one of the stringent duties of the nurse must be to keep a close oversight of the patient's comfort, moving her slightly from side to side as required, and gently rubbing her back with whisky and water to prevent the formation of bed-sores. The lying-in period should cover a full month, the first two weeks of which are to be spent in bed. On the fourteenth day, by which time the fundus of the uterus should have sunk well below the top of the symphysis pubis, the patient may be allowed to sit up, but she should not be permitted to leave her room until the expiration of the four weeks. The observance of such a rule as this will secure for the patient a good "getting-up," without any of the unpleasant sequelæ that are so frequently developed after a neglected lying-in. During the convalescence it often becomes necessary to resort to the use of tonics (quinin, iron, and phosphoric acid), combined with a change of air, in order to restore the patient to her original standard of strength and health. Among the lower classes of society these rigid laws cannot be enforced, and the accoucheur must exercise his judgment in each individual case as to the duration of the period of confinement. In every case before leaving the bed a well-fitting abdominal bandage should be secured, and this should be worn constantly for at least six months,

in order to ensure support for the relaxed abdominal walls and to prevent subsequent uterine displacements.

Diagnosis of the Puerperal State.—Occasionally, from a medico-legal point of view, it becomes necessary to say whether or not a woman has recently given birth to a child. Owing to the severe ordeal through which a woman must pass during the progress of parturition, there are necessarily left some unmistakable signs, the finding of which must be accepted as positive proof of the existence of the puerperal state. It should be remembered, however, that after eight to ten days have elapsed an absolute diagnosis of the puerperium cannot be made. The most important of these signs are as follows: (1) The enlarged uterus, which may be felt as a hard mass above the pubis; (2) the increased length of the uterine cavity, as shown by the sound; (3) the patulous cervix (the finger can be passed through the internal os during the first week of the puerperium); (4) the fissured external os; (5) lacerations along the birth-canal, including tear of the fourchet and perineum; (6) the relaxed condition of the vaginal walls; (7) the characteristic lochial discharge; (8) the relaxed abdominal walls, with the presence of the lineæ albicantes; (9) the presence of milk in the breasts; (10) the large size and tenderness of the breasts; (11) the increased pigmentation around the nipples.

Lactation.

By lactation is meant the suckling of the infant; also, in a more extended sense, that period of the childbearing process during which the child is nourished from the breast. Lactation commences on the third day of the puerperium and lasts until weaning of the child. It is dependent upon the normal functionating of the mammary glands.

Anatomy of the Mammary Glands, Mammæ, or Breasts.—The mammary glands (Fig. 84) are two large, racemose, glandular organs situated on the upper anterior portion of the chest immediately in front of the muscular

structures of the thoracic walls. They correspond to the region from the third to the seventh ribs. They are globular or cone-shaped, and vary greatly in size in different women. At the summit of each breast is situated a small conical elevation known as the *nipple* or *teat;* from it the excreting ducts of the gland radiate; it is surrounded by the *areola*, which shades imperceptibly off into the surrounding cutaneous surface of the gland. *Structure.*—Each gland is composed of *lobes*—from fifteen to twenty-four in number—united by a certain amount of connective and adipose tissue. Each lobe is subdivided into a large number of *lobules*, and these are further divided into a vast number of *acini* or *vesicles*, within which the milk is secreted. Each lobe has its duct, known as a *lactiferous* or *galactophorous duct*, and these all center at the nipple; they each possess an *ampulla* or dilatation just before their termination in the nipple, and in these ampullæ the milk is stored.

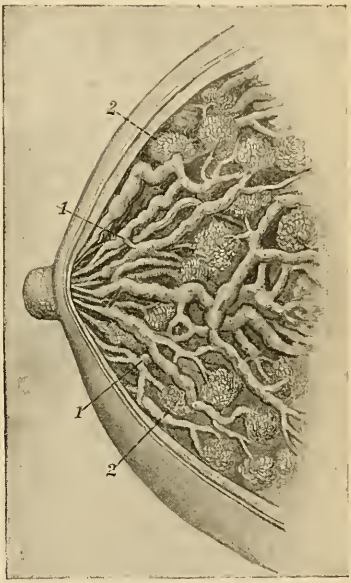

FIG. 84.—Mammary glands: 1, lacteal ducts; 2, glandular acinus (after Playfair).

Milk.—This is the secretion of the mammary glands; it consists of an aqueous basis in which are contained large quantities of *milk-globules* and a variety of substances, such as casein, albumin, fat, lactose or milk-sugar, and salts. It is formed by an overgrowth and fatty infiltration of the epithelial cells lining the acini; these degenerated cells finally rupture and discharge their liquid contents: the aqueous

portion of the milk is directly obtained from the blood by a process of exudation from the blood-vessels. Human milk is a yellowish-white or bluish fluid, somewhat translucent, of an alkaline reaction, and having a specific gravity of from 1024 to 1034; when a digestive ferment, such as rennet, is added to it, a light flocculent coagulum is produced. For the first eight or ten days, in addition to the ordinary constituents there is present in the milk a large number of *colostrum-corpuscles*, which exert a beneficial effect upon the infant. As received from the breast no bacteria are contained in the milk; it is absolutely sterile.

The secretion of milk is established generally at the expiration of forty-eight hours after labor; this may be accompanied by manifestations of slight systemic disturbance, but the so-called *milk-fever* is no longer recognized as a physiologic occurrence; on the contrary, it is regarded as a minor grade of puerperal sepsis. As the milk begins to form the breasts become firm, enlarged, tender to the touch, and painful; the veins become engorged and distended, and inflammatory action may be threatened. The administration of a brisk saline, and the application of the infant or a judicious use of the breast-pump, and massage will generally alleviate the condition. If the pain be very severe, lint wrung out of warm lead-water and laudanum should be laid upon the affected breast, and the patient made to wear a *mammary binder:* this is a Y-shaped appliance, one arm extending around the back and the other two anteriorly, one above and the other below the breasts, the two being brought together between the latter and fastened by a pin.

Method of Improving the Quality and Quantity of Milk Secreted.—The better the quality of the milk, the richer will it be in its fatty constituents. Normally, the proportion of fat contained in human milk averages 4 per cent.; this may be increased by a largely nitrogenous diet, and diminished by an absence or a small proportion of albuminous food. If the quantity of milk secreted falls below the average, it

may be increased in amount by the addition of a glassful of milk at or midway between each meal, or by a similar quantity of malt-extract, ale, beer, stout, or porter; care must be taken, however, that the proportion of fat in the milk be not inordinately increased, with resulting disturbances in the digestive functions of the child. *Conditions that Impair the Quality of Mother's Milk.*—The quality of the milk is influenced by a number of conditions. These may be stated as follows: 1. *Insufficient or improper diet.* 2. *Profound emotion.*—Fear, anger, grief, and other mental conditions, in some way not clearly understood, may so affect the quality of the milk as to render it actively poisonous to the child. It is probable that this results from the production in the milk of noxious leukomains. 3. *Certain Pathologic Conditions.*—It is a curious fact that when the maternal health is impaired from any reason whatever the colostrum-corpuscles are very likely to reappear in the milk and by their presence cause a disturbance of the digestive functions of the child. Any acute infectious process in the mother will, in this way, by profoundly altering the composition of the milk, seriously affect the child. During the continuance of such a condition the child must be hand-fed or given the bottle, but on the return of the normal state of maternal health feeding from the breast should be resumed. Certain chronic systemic affections, such as tuberculosis and syphilis, so gravely alter the composition of the milk as to render feeding from the breast a procedure dangerous to the child. Thus in tuberculosis the disease may be directly transmitted to the child or the milk may be so much impaired in quality by a diminution in the fatty and albuminous constituents as to be insufficient for the nourishment of the infant. Syphilis also may be transmitted from mother to child in nursing; hence a syphilitic mother should not nurse her babe. 4. *Profuse Hemorrhage.*—After a severe hemorrhage the quality of the milk quickly becomes impaired. The question frequently

arises, "Shall a nursing woman continue to feed her child after an early return of the menstrual flux?" The answer to this query is that the simple return of menstruation early in lactation is not sufficient reason why a woman should cease nursing her babe. As long as the child continues to be well nourished by the milk, and does not manifest any ill effects therefrom, the nursing may be continued. Artificial feeding, however, should be resorted to immediately on the appearance of any infantile constitutional or local gastrointestinal disturbance. 5. *Certain drugs*, such as atropin, colchicum, and chloral, pass readily from the mother to the child and affect the latter unfavorably. 6. *The Pregnant State.*—Usually a woman does not possess sufficient vitality to nourish both a nursing child and a developing fetus; under such condition the quality of the milk is very likely to soon become greatly deteriorated. In such cases, however, it is best to postpone placing the child upon artificial food until it be clearly proved that it is not deriving sufficient nourishment from the breast. An additional possible complication to be borne in mind in this condition is the danger of reflex miscarriage from the continual irritation of the mammary gland by nursing.

VIII. THE PHYSIOLOGY AND MANAGEMENT OF THE NEW-BORN.

A few words are necessary as to the proper care of the infant. These may be conveniently grouped as follows:

Immediate Attention.—As soon as the child emerges from the parturient canal it should be grasped by the feet and allowed to hang while the mucus and other foreign material that may be present is removed from the mouth by a soft cloth wrapped around the little finger of the attendant. Generally the child cries almost instantly after

birth, and with this cry respiration is established. The cord is to be severed as soon as pulsation has ceased, and the infant enveloped in a soft blanket or shawl and placed in some portion of the room where it will not be in the way. The attention of both physician and nurse should then be directed toward providing for the immediate comfort and safety of the mother: when she has been rendered as comfortable as the circumstances will permit the child may again be taken up and attended to. The first duty now is to ascertain that respiration is progressing satisfactorily and that complete ligation of the cord has been effected; neglect of the latter precaution has resulted in loss of the child from hemorrhage: if the ligature has become relaxed or has slipped, it should be tightened or another applied. In difficult breech presentations it is well also to examine the child for fracture of the bones of the extremities—a frequent complication in these presentations.

The Physiology of the New-born.—As would be expected, marked changes take place in the body of the child at birth. Up to this time an absolute parasite, so to speak, it now becomes largely an individual, being capable, if need be, of an independent living. The subject of the physiology of the infant is an interesting one, and it can best be studied by considering separately the various systems of the body.

(1) *The Circulatory System.*—Very interesting and important physiologic changes occur in the fetal circulation at the time of birth. Ligation of the cord cuts off all communication with the mother and initiates the new form of circulation, the postnatal. The hypogastric arteries are no longer of service; they therefore dwindle away and become impervious fibrous cords. The foramen ovale closes, and in a few days is hermetically sealed, so that communication between the two auricles is no longer possible. The function of the Eustachian valve, which was to direct the

ascending current of blood through the foramen ovale, being abolished, it undergoes the common atrophy of these now functionless fetal structures. Upon the establishment of respiration the lungs assume their wonted activity, and, the resulting metabolic changes hitherto not taking place, demand an increased blood-supply. The blood from the right ventricle, therefore, instead of passing mainly through the ductus arteriosus, is directed through the pulmonary artery into the lung-tissue, and the fetal structure again atrophies and becomes impervious, merely existing as a fibrous cord. A similar change occurs in the region of the liver, and the blood passes entirely into the portal circulation, the ductus venosus closing and joining in the atrophic process. The *blood* differs from that of the adult in containing an excess of white blood-corpuscles, together with a large number of the so-called *shadow-corpuscles*, or decolorized red blood-corpuscles. It is said that there are from six to seven millions of the red corpuscles to the centimeter. The normal *pulse-rate* of the infant is from 120–160 beats per minute, and may be counted by applying the ear to the infant's back over the region of the left scapula.

(2) *Respiration and its Establishment.*—The normal respiration-rate of the new-born child is about 44 per minute; this continues for some weeks, gradually falling to 35 or 36 per minute. *Cause of the Establishment of Respiration.*—It is probable that respiration is established as the result of a duplex action both elements of which are reflex. As soon as the cord is ligated the supply of oxygen, that up to this time has been derived from the mother, is cut off, as is also the escape-vent for the carbon dioxid generated in the fetal body; consequently, there occurs a rapid accumulation of carbonic-acid gas in the body, and this, in accordance with its normal action, stimulates the cerebral respiration-center to functionate. The second factor is a reflex muscular contraction caused by the sudden transference of the fetal body from a liquid environment of the

temperature of the human body (98°–99° F.) to an atmosphere having a temperature of but 75°–78° F.

(3) *The Gastrointestinal System.*—Owing to the absence or very small amount of saliva and salivary ferment, ptyalin, the ability of an infant to partially predigest starchy material is absent. As a consequence, all starchy food is contraindicated for children until the digestive juices are freely manufactured in the body. There is a similar failure of activity on the part of the pancreas, and from these deficiencies in the digestive functions of the infant arise all of those serious digestive disturbances that are so common, and that often result so disastrously to bottle-fed and improperly-cared-for infants, especially during the summer season. The digestion proper is largely carried on through the activity of the bacteria that normally exist in the alimentary canal. The *liver* is very much increased in size, constituting probably one-thirtieth of the body-weight, and is functionally active, although not to the extent that it is in the adult. *The Bowels.*—For the first two days the intestines are filled with meconium, which has already been described; under the laxative influence of the colostrum-corpuscles this is soon expelled, and the stools then acquire their normal appearance—light-yellow in color, acid in reaction, and sour to the taste. The normal number of stools is four in the twenty-four hours.

(4) *The Genitourinary System.*—The kidneys functionate regularly, and there is always a discharge of urine immediately after or during birth. The urine contains a certain amount of albumin for the first few weeks of life, and at times, in babes at the breast, traces of sugar—lactosuria; its specific gravity is about 1003–1005, and its reaction acid. Owing to the small amount of biliary coloring-matters that it contains its color is slight and it may even fail to impart a stain to the diapers, so that inexperienced mothers or nurses may report a failure of the kidneys to act. The number of micturitions in the twenty-four hours may vary

from six to twenty; the diapers, therefore, should be changed fifteen or twenty times in the day, or even every hour. The repeated wetting may result in chafing of the genitalia, buttocks, and thighs; this may be remedied by the application of cold cream and bland dusting-powders, such as talcum-powder.

(5) *The Eyes.*—These are always hypermetropic; bright lights should therefore be avoided, and the child should never be laid in such a position that a strong light will strike its face.

(6) *The Hearing.*—At birth the fetus is deaf, mainly because of non-inflation of the middle ear, but partly because of stoppage of the external auditory canal by vaginal and other secretions. Sounds of some intensity become audible by the end of twenty-four to forty-eight hours.

(7) *Taste.*—The sense of taste is but poorly developed at birth; it is probable, however, that substances having strongly sapid qualities may be noticed by the infant.

(8) *The Temperature.*—Normally the rectal temperature is 99° or 99½° F.; it is readily influenced by changes in the condition of the child's health, and will show striking variations in response to the most trifling causes. The amount of food absorbed by the child seems to have some influence in augmenting the temperature.

(9) *The Skin.*—It has been noted that cutaneous sensibility is slight at birth, but that by the expiration of from twenty-four to forty-eight hours it has reached the normal. The change in environment very commonly results in a peculiar congestion or redness of the skin, known as *gum*, *gum-rash*, or *strophulus*, during the first week of life, and this may even extend to a certain amount of exfoliation of the epidermis. This demands no treatment other than the avoidance of rubbing during the daily bath, the wearing of soft, non-irritating clothing, and the judicious use of dusting-powder or vaselin.

(10) *The Breasts.*—It is quite common for the breasts of

children of either sex to become swollen and sensitive during the first few days after birth, and even to contain a small amount of milky fluid. When so congested the breasts should be protected from injury of any kind; especially should all manipulation be interdicted. Meddlesome nurses and midwives have repeatedly initiated mammary abscesses through ill-directed efforts to remove the secretion from the breasts under the superstitious belief that it boded evil to the child. According to Parvin, relief may be afforded by bathing the breasts in hot water and then applying a warm mixture composed of 3 parts of sweet-oil and 1 of camphor.

The Cleansing and Bath.—To a greater or less degree the surface of the fetal body will be found to be covered with the vernix caseosa already described. This may be most satisfactorily removed by well smearing the entire surface of the child with sweet oil or vaselin, especial attention being paid to the scalp and the various cutaneous folds. This inunction should be allowed to remain for a few hours—five or six—the child again being wrapped in the warm blanket. At the expiration of this time a bath should be given in warm water (95°–98° F.) with pure Castile soap, soft pieces of lint or a soft sponge being used for the purpose. Excessive rubbing of the skin should not be permitted, for by such handling of the delicate structure a gummy eruption may be produced or more severe eczematous affections be initiated. The child should not be placed in the bath, but only one portion of the body should be bathed at a time, the rest being enveloped in the blanket. Gentle mopping with lint will dry the surface, which should then be well dusted, especially in the axillæ and in the folds about the buttocks and neck, with violet powder, talcum, lycopodium, fuller's earth, or other bland baby-powder. A bath should be given subsequently each day about noon-time, the temperature of the water being slightly above 90° F.; the best Castile soap should be used. In giving the bath the soap should first be well

applied and the body then rinsed, the child being held over the bath-tub. The eyes must be protected during this process. The mouth should be wiped out at each bath by the finger, around which the cloth is wrapped.

The Care of the Cord.—After the bath the cord must be dressed. This is preferably done by passing it through a piece of salicylated cotton and then dusting it with powder composed of salicylic acid 1 part and finely pulverized starch 4 parts; the edges of the cotton are then folded over the cord, which is thus entirely shut off from contact with the atmosphere. A popular dressing is a small square of charred linen or a layer of borated cotton, perforated in the center; through this the cord is passed, and the ends of the linen or cotton square are folded over and secured by a safety-pin. If the salicylic acid cannot be obtained, an efficient dusting-powder is one composed of iodoform 1 part and bismuth subcarbonate or bismuth subnitrate 2 parts; sennin, a chemically pure and strongly antiseptic product of boric acid and phenol, may be used for the same purpose. If the binder be not employed, the cord having been wrapped in antiseptic absorbent cotton is turned up and secured to the abdomen by a small strip of adhesive plaster 1 inch wide and 6 inches long. This ensures absolute cleanliness, and is a further precaution against the development of septic processes in the stump. The adhesive strip may be removed by moistening with warm water. If the latter method be not employed, the dressing should be renewed daily in order to prevent septic peritonitis from absorption of poisonous material through the umbilicus. In about twenty-four hours a line of demarcation forms near the base of the cord, and the latter undergoes a process of mummification, and generally drops off on the fourth or fifth day. The granulating surface that is left gradually dries, the process being facilitated by generous applications of the dusting-powder. Should the attachment of the cord persist longer than the fourth day, the few remaining shreds

of tissue should be severed back of a ligature. Allen[1] employs the following moist antiseptic dressing for the umbilical stump, thorough asepsis of the hands being observed: After the child is bathed the cord and abdomen are cleansed with a 1 : 1000 mercuric-chlorid solution, and the cut end of the funis is touched with a mercuric-chlorid tablet. A piece of sterile gauze 4 inches square is prepared by cutting a hole in its center and saturating it with pure glycerin; in this the stump of the cord is entirely enveloped. It is then turned up on the abdomen, another pad of gauze soaked in glycerin placed over it, and the whole held in place by a sterilized flannel bandage. It is claimed that cords thus treated fall off in three days. Until this occurs the bandage is opened twice daily and the cord-wrapping is saturated with glycerin, the upper pad being replaced with a fresh piece of gauze. After the cord falls the depression left, known as the *umbilical fossa*, must be filled with aristol, a dry pad of gauze placed over it, and the bandage reapplied.

Dressing of the Infant.—It is important that the child be warmly and yet lightly clothed. A proper dressing for the summer is the following: Next to the abdomen should be placed a soft flannel binder, popularly known as the *belly-band;* this extends from the nipples to a point midway between the umbilicus and the symphysis. A popular error is to draw the band too tightly around the child; it should be loosely applied, in order not to interfere with respiration, should be of but two layers, and should be secured by small safety-pins. It maintains the dressing for the cord and prevents undue bulging of the abdominal walls and umbilicus. The *napkin, square*, or *diaper* is next applied, and this should be made of soft old cotton material secured in front by a safety-pin. Next is worn a soft shirt, a linen petticoat, and over all a long white dress secured at the shoulders. In winter the shirt may be made of knitted material, and the petticoat should be of flannel and an additional

[1] *American Journal of Obstetrics*, April, 1894.

one worn. The feet should be protected by the ordinary knitted shoes. The child should be supplied with a knit jacket to be worn in cold weather and at night, and should it show evidence of coryza, a linen or flannel night-cap may be used with benefit. When dressed the child may be placed at the breast or laid in its crib and covered.

The Caput Succedaneum, or "Accessory Head" (Fig. 85).—This is the tumor situated upon the presenting part of the fetus, and formed by a serosanguineous infiltration of the connective tissue of the part; it varies in size according to the length and severity of the labor, and may be entirely absent in precipitate labor. It is due to an edema of the part that is not compressed by the maternal structures: it is a result, therefore, of the lack of pressure, and is not due to pressure, as is often stated. It requires no treatment, disappearing, as a rule, by the fourth day.

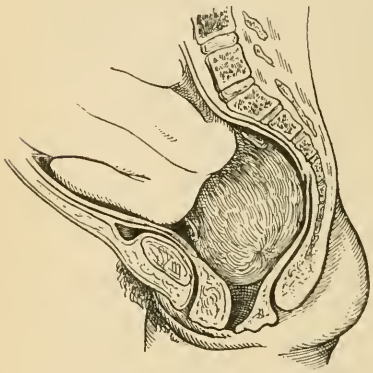

FIG. 85.—Formation of the caput succedaneum.

Moulding of the Head.—In its passage through the parturient canal, the head in vertex presentations undergoes marked alterations in its shape consequent upon the pressure made upon it by the rigid tissues through which it travels, especially by the promontory of the sacrum. The main change consists in an increase of the anteroposterior diameter with a diminution in the transverse diameters. This distortion of the head generally disappears by the third or fourth day, and its disappearance may be facilitated by gentle moulding of the head by the nurse or physician each day at the time of bathing.

The Nursing.—An excellent rule to adopt is, immediately

after the child is cleansed, to give it the breast and allow it to suckle for five or six minutes from each nipple; in this way it swallows the colostrum, which is nature's purge, and thus is freed from a large amount of the meconium; it also acquires the power of nursing, which may be lost if the child be kept too long from the breast. During the first two days before the milk-formation has begun the breast should be given to the child every four hours. The sugar-and-water mixtures of the old nurses are to be positively prohibited. The child is not to receive any food during this period other than the small amount of material it derives from the mother's breasts, unless it become importunate, when ~~two or three drams of a mixture of condensed milk and sterilized water, 1 part to 12, may be administered after each nursing~~. *The Time of Nursing.*—Regularity in the time of nursing must be observed for the preservation of maternal and fetal health, and the importance of this law cannot be too strongly impressed upon the mother and nurse. Until the establishment of the milk the child may be given the breast every three or four hours. During the first month it should be fed every two hours, and after that time every two and a half to three hours, the first nursing being at six o'clock in the morning and the last at eight o'clock in the evening. After the seventh month five nursings *per diem* will suffice. During the night no more than two nursings should be allowed, and one at about twelve or one o'clock will generally answer; if not, a second one at four o'clock may be given. That this routine be not interrupted, it is proper to awake the child when the hour for nursing arrives. If the feeding be at more frequent intervals than as just stated, the usual effect upon the mother is to raise the specific gravity of the milk by causing a concentration of its elements; as a result, the normally deficient digestive power of the infant's stomach is overtaxed by the concentrated food, and a moderate amount of dyspepsia is produced, while at the same time the child

over-feeds, and in this way still further contributes to the digestive disturbance. The duration of the nursing should be from ten to twenty minutes only. *Capacity of the Infant's Stomach.*—In order to appreciate just how much milk should be given at a feeding, some idea as to the

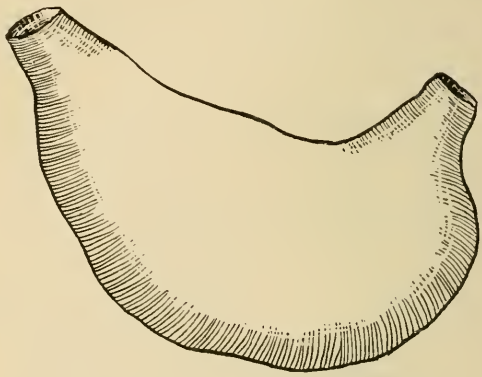

FIG. 86.—Stomach of infant at birth (natural size).

normal capacity of the stomach must be entertained. Emmet Holt has found that the average stomach of an infant at birth will hold one ounce, and that this capacity increases at the rate of about one ounce per month until the sixth month, and from thence on at the rate of a little under an ounce per month. If it be desired to know the exact amount of milk ingested at any one nursing, a very good approximation may be made by weighing the child immediately before and immediately after the feeding. Owing to the peculiar position of the stomach of an infant —high up under the false ribs, with its long axis directed more perpendicularly than in the adult—any over-distention is quickly followed by regurgitation of the excess, unaccompanied by expulsive efforts—a very common phenomenon in young infants.

Growth and Development of the Child.—When properly nourished the child will show a steady increase in

weight and size and will give the appearance of health and infantile contentment. The growth in weight is on an average at the rate of about a pound and a half per month up to the fourth month, and after that time at the rate of one pound per month. This increase in weight is often very anxiously watched by the mother, and it is well to have some standard of comparison by which the rate of growth may be estimated. For this reason a table of the standard weight of an infant for the various months of its first year as determined by actual measurement is appended. At birth the average infant weighs 7⅓ pounds; during the first few days subsequent to labor there is a slight loss of weight followed by a corresponding gain, so that at the end of the first week the infant will probably weigh about as much as it did at birth. The weight is increased to about 7¾ pounds at the end of the first month.

Month.	Weight in Pounds.	Month.	Weight in Pounds.
1	7¾	7	16
2	9½	8	17
3	11	9	18
4	12½	10	19
5	14	11	20
6	15	12	21

In size a healthy child should grow nearly three-quarters of an inch for each month during the first year of life, and during the second year about half an inch per month.

Weaning, or Ablactation.—By this term is meant the ending of the nursing-period and the transference of the child from mother's milk to other food. Usually a child should be weaned not earlier than the ninth month and not later than the twelfth month; occasionally weaning may be accomplished as early as the sixth month. Weaning should not take place during excessively warm weather or while the child is suffering from any attack of illness not dependent upon deficiency in its original food-supply. *Indications for Weaning.*—The indications for weaning are as follows: 1. Any disagreement of the maternal milk with

the digestive function of the child; 2. The presence in the mother's system of some grave systemic poisoning developing late in lactation, such as syphilis or tuberculosis; 3. The advancing age of the child, with the appearance of the teeth; as a rule, the child should not be completely weaned until six or more teeth have appeared, by which time the power to digest stronger food will be present; 4. A growing dislike on the part of the child for the mother's milk; 5. An insufficiency or total absence of milk in the breasts. *Method of Weaning.*—It is, as a rule, not safe to wean a baby suddenly. The proper method is to give daily for a couple of weeks one artificial meal of cracker and milk or beef-tea, or thin chicken-broth containing barley, rice, or bread-crumbs. If this meal be found to be well borne, an additional meal may then be given, and the child thus accustomed gradually to the taking of table-food. In proportion as this is increased, the breast-milk may be diminished until the child is completely weaned. It is proper to teach every infant over six months of age to drink milk from a cup. Malted milk, condensed milk, and some of the better prepared foods are sometimes of service as the child approaches the period of weaning. An egg or the white of an egg, beaten up with milk or in a delicate broth, may occasionally be given; with proper supervision the child may be allowed to suck a piece of steak or to gnaw on chicken-bones. A common error, and one that results fatally in many instances, is to allow the child to advance too rapidly to a diet of vegetables and fruits. It should be remembered that at birth the infant is purely carnivorous, and that it requires the lapse of months before its digestive organs become able to cope with vegetable food. *Drying up of the Breasts after Weaning.*—The secretion of milk will often continue for some time after the child has been weaned, and its presence may be a source of considerable discomfort to the woman, so much so as to call for interference on the part of the medical adviser. In such cases the

use of saline aperients will exert a powerful depletive effect, and their action should be supplemented by the ingestion of as little fluid as possible and the administration of certain drugs, such as potassium iodid in large doses—from 25 to 30 grains three times daily. Locally, applications of warm lead-water and laudanum or lint saturated with warm cologne-water will relieve the distention, together with the use of gentle massage and the careful and judicious employment of the breast-pump. Cocain, also, in weak solution, applied locally, has been claimed to promptly reduce the production of milk. Belladonna-ointment or a glycerol of belladonna (made by rubbing a dram of the extract of belladonna with an ounce of glycerin) applied to the surface of the breast may be a valuable adjuvant in arresting the secretion of milk.

The Baby's Outing.—Merely a word will suffice as to this point in the proper management of an infant. There is no fixed law upon the subject, but it is generally thought best by well-regulated families not to permit the child to leave the house in winter until it has attained the age of three months, and then it is to be taken out only on a clear day and just before the noon hour. In summer, if desired, the child may be taken into the yard after the second week, and after it is two months old it may spend most of its time in the coach out of doors, avoiding, of course, an excess of sunshine or prolonged exposure to strong winds.

PART II.—PATHOLOGIC OBSTETRICS.

INTRODUCTION.

Hitherto we have been dealing only with the normal state of a woman during the time that must elapse from conception to the weaning of the child. While it is possible for such a condition of eucrasia to exist that the mother and her offspring will pass through this critical period without falling victims to any of the numerous diseases and mishaps that thickly beset the childbearing era, such an immunity is exceedingly rare. In the vast majority of cases there will be manifested at some time and to a greater or less degree one or more of the pathologic states that are familiar to an obstetrician of any experience whatever. The physical imperfections of parents and ancestors, perhaps latent and obscure hitherto, will reveal themselves in serious and often fatal form in the unfortunate offspring; the pernicious influence of years of improper hygienic environment resulting in faulty and imperfect bodily development will be manifested in pregnancy in exaggerated and pathologic reflex neuroses, and in labor in a grave and complicated form of dystocia; want of proper antiseptic precautions on the part of physician or nurse, or irremediable non-hygienic surroundings exerting a pernicious influence notwithstanding the best of such precautions, will result in grave puerperal complications; through some unexpected and unavoidable combination of circumstances the normal management of the new-born infant must be widely deviated from, and the risks and often serious consequences of such deviation to both mother and child must be combated. With such grave possibilities menacing each and

every stage of this eventful period it is no wonder that it is exceptional for a woman to pass through it unscathed from beginning to end.

In order to the clearer and more systematic presentation of these manifold pathologic conditions, and in accordance with the system adopted in the foregoing portion of this book, a chronologic sequence has been selected as the most satisfactory and rational method of dealing with the subject. Treated in this manner, the following natural subdivisions present themselves for consideration:

I. Diseases of the Ovum and the Fetal Appendages.
II. Pathologic Conditions of the Fetus.
III. The Pathology of Pregnancy.
IV. Dystocia, or Difficult Labor.
V. The Pathology of the Puerperium.
VI. The Pathology of the New-born.

I. DISEASES OF THE OVUM AND THE FETAL APPENDAGES.

1. Diseases of the Membranes.

(*a*) **Pathologic Conditions of the Deciduæ.**—Diseases of the maternal membranes are the most frequent pathologic processes of intrauterine life, and because of their great frequency and their grave sequelæ, the most common of which is abortion, they well deserve early mention in the pathology of obstetrics.

(1) *Deciduitis,* or inflammation of the decidual tissue, is in reality an endometritis modified by the peculiar changes wrought in the uterine mucosa by pregnancy. The disease may be either *acute* or *chronic. Acute deciduitis* is very rare. It may result from trauma, filth, or certain infectious diseases, and occurs in three well-marked forms—namely, the infectious or exanthematous, the hemorrhagic, and the purulent. (*a*) *Infectious* or *exanthematous deciduitis* is that form accompanying the development of the exanthema-

tous diseases during pregnancy. It is a well-known fact that the mucosæ of the body participate in the eruption of these diseases, and it is probable that when such a disease attacks a pregnant woman the hypertrophied uterine mucosa, because of its extreme vascularity, becomes intensely inflamed and covered with the eruption. The almost inevitable result is abortion, the discharge of the ovum taking place just as the efflorescence appears upon the skin. The maternal mortality in this variety is high. (*b*) *Hemorrhagic deciduitis* is a very rare form accompanying acute infectious diseases such as Asiatic cholera. It is destructive to the product of conception, and likewise is generally fatal to the mother. (*c*) *Purulent deciduitis* is a septic and often rapidly fatal form characterized by the presence of an offensive and purulent discharge. It is usually a sequel of attempts at criminal abortion, but it may follow other traumatisms. *Treatment of Acute Deciduitis.*—The management of the acute inflammations of the decidua consists merely in attention to the complications as they arise, the prevention of excessive hemorrhage, and the favoring of the abortion should the signs of a discharge of the ovum appear. Efforts to arrest the threatened escape of the ovum would be misdirected.

Chronic Deciduitis.—Chronic inflammation of the decidua is a very common affection, and is probably the predisposing cause of the vast majority of early abortions. As to its precise etiology there is much conjecture, though but little is actually known. It is probable that the following may act as causative factors in many cases: (1) A pre-existing neglected endometritis which, under the stimulus of gestation, assumes renewed activity; (2) Syphilis; (3) Death of the fetus, with the production of irritating retrograde products that act locally upon the decidua; (4) Over-exertion and excessive work; (5) General systemic dyscrasia. There are described four clearly-defined forms of this disease—namely, the diffuse hyperplastic, the tuber-

ous or polypoid, the cystic, and the catarrhal. (*a*) *Chronic Diffuse Hyperplastic Deciduitis* (*Endometritis decidua chronica diffusa* vel *Endometritis gravidarum hyperplastica*).—As the name indicates, the pathology of this disease consists essentially in an inflammatory overgrowth of the deciduæ, especially of the decidua vera, with the production of a firm sarcous mass. This disease is a common one, and generally occurs secondarily to a preexisting endometritis. If it develop early in pregnancy, as is usual, there can be but one result—namely, decidual apoplexy with abortion and the discharge of a piece of meat-like substance, a so-called *fleshy mole*. Occasionally these fleshy masses may be retained *in utero* for months and undergo partial organization. In the rarer cases in which the development of the disease occurs late in pregnancy the fetal growth may not be interrupted and gestation may proceed to term; there then follows the formation of extensive adhesions resulting in that serious complication of labor, adherent placenta with retention of portions of the decidua vera. (*b*) *Chronic Tuberous* or *Polypoid Deciduitis* (*Endometritis decidua tuberosa et polyposa* vel *Endometritis gravidarum polyposa*).—This is a rare variety of the preceding condition, and consists in a localization of the inflammatory process in scattered areas of the decidua; at these foci of inflammation excessive overgrowth of the decidual tissue occurs, with the formation of polyp-like growths that are most frequently located upon the anterior or posterior uterine walls as determined by the position of the ovum, the growths directly facing the site of the latter. The polyps may attain a considerable size (from ½ to ¾ of an inch in length) and are exceedingly vascular. The inevitable result of this affection is early abortion (from the second to the fourth month) from fatty degeneration and decidual apoplexy. (*c*) *Chronic Cystic Deciduitis* (*Endometritis gravidarum cystica*).—A variety of the hyperplastic deciduitis in which not only is there an overgrowth of the decidual connective tissue, but also an occlu-

sion of the ducts of the utricular glands, with hypersecretion and accumulation of the mucus, forming large-sized retention-cysts. If spontaneous cure or abortion does not take place, a variety of hydrorrhea results. (*d*) *Chronic Catarrhal Deciduitis* (*Endometritis gravidarum catarrhalis* vel *Endometritis decidua catarrhalis*). This is an interesting form of deciduitis, of less severity than the others, and characterized mainly by excessive activity of the glandular elements of the endometrium; there is associated to a certain degree a hyperplasia of the constituent elements of the decidua. This condition is most common in multiparous women, and occurs generally after the sixth month of gestation, although it has been noted as early as the third month. When occurring early in pregnancy the fluid escapes gradually and only in small amounts; at times, however, the adhesions between the reflected layer of the decidua and the decidua vera prevent its escape in this way, and an accumulation of the secretion occurs, often to a remarkable degree; instances are reported where a pound or more of the fluid has been stored up in the uterine cavity. As a result of the immense pressure exerted by this large collection of fluid the adhesions between the deciduæ are torn apart and the water escapes in a gush—the so-called *hydrorrhœa gravidarum* (*hydrorrhœa decidualis*), or "false waters," closely resembling the escape of the liquor amnii when the membranes are ruptured. This discharge may take place without any premonitory symptoms, and may not be accompanied by other clinical manifestations; occasionally, however, there are present trivial pains due to slight uterine contractions. *Cause.*—There is considerable obscurity as to the exact etiology and pathology of decidual hydrorrhea. Thus, Braun emphasizes the preexistence of an endometritis with resulting exudation. Hegar considers the pathologic process to be of the nature of a decidual hypertrophy especially involving the glandular substance. Scanzoni, Zini, and Chazan refer it to the condition of the blood, Scanzoni believing that the disease

results from a transudation of serum from the watery blood, Zini regarding the fluid as an extravasation resulting from the hyperemia of the uterine mucosa, and Chazan referring it to the periodic congestion of the genital organs that occurs during pregnancy. *Source of the Fluid.*—Just as an uncertainty exists as to the etiology of the disease, so various theories are advanced as to the source of the fluid. It is probable that there is no one constant source, but that the fluid may accumulate as a result of pathologic processes located in various structures of the developing ovum. Without a doubt in some cases there exists a true edema or serous infiltration of the uterine wall, resulting in an accumulation of fluid between this and the membranes. In other cases Kaltenbach and others claim that the fluid collects between the opposed surfaces of the decidua vera and decidua reflexa in the space that normally exists between these membranes during the early period of pregnancy (the first three months). There are two facts that would seem to demonstrate the probability of such an origin—namely, the frequent development of the malady during these months of gestation, and the fact that occasionally in this disease the immensely thickened vera has been separately expelled after the placenta, thus proving absence of union between the deciduæ vera and reflexa. It is the belief of Hennig and Schroeder that the accumulation of the fluid occurs between the chorion and the decidua, while Duges and Jörg assert that a persistence of the allantoic sac may produce a hydrorrhea. They claim that in many instances the amnion and chorion, instead of being glued together by an amorphous tissue, are separated by a collection of fluid, so that two sacs are present in the after-birth ; it may be that these so-called "*false waters*" may escape during pregnancy in the form of a hydrorrhea, although this is incapable of actual demonstration because of the inability to chemically distinguish the fluid from the true liquor amnii (Döderlein). Intensely interesting as the subject is, the etiology and pathology remain

as yet largely matters of conjecture, awaiting the results of further research. *Character of the Fluid.*—The fluid that is discharged in true hydrorrhœa gravidarum is clear, thin, watery or mucopurulent (occasionally serosanguinolent), of a pale-yellow or slightly reddish tinge, highly albuminous, and with a peculiar spermatic odor. Repeated gushes may occur at irregular intervals when the patient is on her feet or while she is resting in bed. *Diagnosis.*—So closely does this condition of hydrorrhea resemble the escape of the liquor amnii that some points of differentiation should be indicated in order that a correct diagnosis may be made.

Hydrorrhœa Gravidarum.	*Discharge of the Liquor Amnii.*
The discharge may occur days or even weeks before labor.	The discharge immediately precedes delivery.
Usually there are no premonitory symptoms.	Usually labor-pains or the premonitory and other signs of labor have been present for some minutes or hours.
The flow occurs at intervals.	The discharge occurs but once.
The os uteri is closed.	The os uteri is patulous.
Ballottement may be elicited, proving the presence of the liquor amnii.	Ballottement cannot be elicited.
The fluid is highly albuminous and contains mucin.	The liquor amnii contains only a trace of albumin, but considerable amounts of urea and urates. (This is the main test in the diagnosis of those rare cases of amniotic hydrorrhea.)

Treatment of Chronic Deciduitis.—For the first three varieties of deciduitis no management other than symptomatic treatment is required. When abortion is threatened efforts should be made to preserve the product of conception, and if these efforts prove futile, danger from hemorrhage and sepsis should be averted, and the patient subsequently treated as a puerperal woman. In the case of hydrorrhea generally no treatment is indicated; if it be accompanied by painful uterine contractions, rest in bed with the administration of opium by the mouth or *per rectum* will suffice.

(2) *Hemorrhage from the Decidua, or Decidual Apoplexy.*—Owing to the extreme vascularity of the deciduæ, and the rapid growth and distention of their blood-vessels and cap-

illaries, the latter manifest a peculiar tendency to rupture, with the production of an effusion of blood into and between the membranes. This is most common during the first two months of gestation, and the usual result is abortion. If this follow immediately after the effusion of blood, the expelled mass is termed a *blood* or *sanguineous mole* (*mola sanguinea*); if the discharge be postponed for some weeks, a certain amount of organization of the blood-clots takes place, and the mass when finally expelled presents a peculiar meat-like appearance and is termed a *carneous* or *fleshy mole* (*mola carnosa*); in exceptional cases a deposit of lime-salts may take place in these organized clots, and the mass, which is hard and stony, is then termed a *calcareous* or *stone mole;* a gestation thus prematurely ended is termed a *false* or *molar pregnancy*, and the product a *blighted ovum*. The etiology of apoplexy of the decidua embraces traumatism of various kinds (including too frequent coitus) and chronic nephritis, the decidua sharing in the general tendency to apoplexy manifested by this disease. The *treatment* is that of abortion.

(3) *Atrophy of the Decidua.*—In some rare cases the uterine mucosa fails to undergo the development that normally takes place during pregnancy. As a consequence of this atrophic condition of the decidua the impregnated ovum does not find sufficient lodging-place in the fundus uteri; it remains at its normal site until its increasing weight becomes too great for the decidual adhesions, which it gradually stretches into the form of an elongated pedicle. It finally lodges within the cervix, and there it continues to develop until by its growth reflex contraction of the cervix is produced and the ovum is expelled. This condition is termed a *cervical pregnancy* and is most common in primiparæ. The *treatment* is that of abortion.

(4) *Tumors of the Deciduæ.*—Neoplasms of the deciduæ are very rare. Two varieties have been recognized. (*a*) *Deciduoma.*—This is a non-malignant growth composed of decidual relics that have undergone hyperplasia. The

symptoms produced by this tumor are hemorrhage more or less severe, a fetid and profuse leukorrhea with possibly the occasional discharge of fragments of decidual tissue, and a certain degree of blood-poisoning as evidenced by elevation of temperature, prostration, and chilly sensations. The deciduoma is but slightly attached to the uterine wall. The only treatment of this growth consists in its complete removal by the curet under antiseptic precautions, followed by the introduction of an iodoform-tampon. Internally, quinin and stimulants are indicated. (*b*) *Deciduosarcoma, Malignant Deciduoma.*—This is a malignant degeneration of retained decidual débris characterized by a tendency to the formation of metastatic deposits throughout the body, and rapidly proving fatal in from five to six months after delivery. It may follow cystic disease of the chorion. The treatment is hysterectomy. The curet and iodoform-gauze may be employed, but generally the neoplasm promptly returns.

(*b*) **Pathologic Conditions of the Chorion.**—(1) *Chorionitis,* or inflammation of the chorion. In common with other vascular tissues the chorion is subject to slow forms of inflammation that result in the production of more or less dense bands of adhesion between it and the amnion and decidua. This inflammation may be, and very frequently is, syphilitic in origin, or the chorion may participate in an inflamed condition of the decidua secondary to a preexisting endometritis. If the process become well marked, abortion is apt to follow. The treatment is purely symptomatic.

(2) *Cystic Disease of the Chorion.*—*Synonyms.*—Hydatidiform, Hydatiform, Hydatoid, Cystic, Placental, or Vesicular Mole; Hydatidiform or Myxomatous Degeneration of the Chorion; Dropsy of the Villi of the Chorion; Cystic Degeneration of the Villi of the Chorion; Cystic Disease of the Ovum; Uterine Hydatids; Molar Pregnancy.—This is a rare affection of the chorion consisting in a proliferative degeneration of the chorionic villi, with the production of a mass

of grape-like vesicles attached to the placenta and known as *placental moles* (Fig. 87); these vesicles vary in size from that of a pin's head to a walnut or larger, and they contain a transparent fluid closely resembling the liquor amnii. The disease is an exceedingly rare one, statistics showing that it occurs but once in about two thousand cases of pregnancy. A curious feature of the affection is the tendency it shows to recur in successive pregnancies in a given individual, one patient, reported by Mayer, suffering with the disease eleven times. The number of cysts may be very vast, even five thousand or more, each cyst having a pedicle which is attached to another cyst and not to a common stalk; the entire mass of diseased villi may attain the size of a fetal head or in rare instances occupy a bulk equal to that of a fetus at term or even larger, and weigh several pounds. *Time of Development.*—Most commonly, according to Bloch, Louis Meyer, Schroeder, and Kehrer, the disease originates during the latter part of the childbearing period, 22 per cent. occurring in the fourth and fifth decennia; it usually appears during the first month of gestation, and when it occurs thus early the fetus quickly dies and may be entirely absorbed. If the disease develop later, in the second or third month, while fetal death may result, provided sufficient of the membranes and placenta be involved, it is possible for the life of the fetus to be preserved. In case of fetal death at this period of gestation complete absorption does not generally take place. *Causes.*—The true etiology is obscure, but among the probable causes may be enumerated the following:

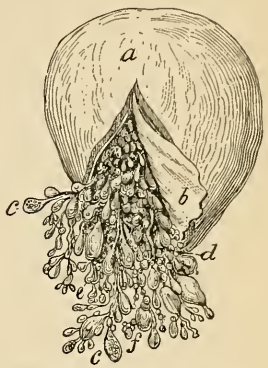

FIG. 87.—Hydatiform mole: *a*, decidua; *b*, chorion and amnion; *d*, vessels; *c*, *e*, *f*, vesicles of different size and form.

(1) Preexisting endometritis or metritis; (2) the presence of uterine fibroids; (3) a chronic deciduitis; (4) some grave maternal dyscrasia, such as syphilis or carcinoma (Virchow); (5) abnormal allantoic development, such as absence or deficiency of the vessels (Spiegelberg); (6) some obscure fetal disease (probably syphilis); (7) fetal death (Graily Hewitt, Greise). An interesting and as yet unanswered question is, "Is the disease primarily embryonic or maternal in origin?" In other words, is embryonic death the cause or the outcome of the pathologic process in the chorion? While no definite answer can be given, it is probable that in some instances, it may be in the majority of the cases, the disease follows a pathologic process in the embryo, resulting in its death, while in other cases death of the embryo is a direct outcome of interference with the function of the chorion, the result of the dropsical condition of the villi. In either case, the disease occurring within the early weeks of pregnancy, entire absorption of the embryo may follow. *Pathology.*—The first portion of the chorion to participate in the degenerative process is the epithelium of the villi. The connective-tissue cells undergo an immense proliferation, and the fibrous tissue thus formed is grouped in small areas; the remainder of the villus is unchanged. By the growth of these elements each villus becomes distended, and many of the epithelial cells undergo a liquefactive process; the fluid thus produced separates the connective tissue and forms a reticulated mesh within the interior of the villus. These membranous tufts maintain the same form as the normal chorionic tufts of the first two months. There are formed in this manner the characteristic grape-like bodies. The vascular supply of the diseased tissue is derived from the connections of the chorion with the decidua, and the tufts consist of living, growing tissue-elements. *Varieties of Hydatidiform Moles.*—Vesicular moles are, according to Kehrer, observed in four different forms: 1. *Mola hydatidosa incipiens.*—In this variety a cyst is formed, about

the size of an ovum of the third or fourth month of gestation, consisting of an amnion and a chorion, upon the surface of which there are numerous vesicles. The embryo is either entirely absent or some of its fragments float in the liquor amnii. The umbilical cord may be present or absent. 2. *Mola hydatidosa partialis.*—In these cases the fetal membranes and the placenta are normally developed, but some of the placental villi are surmounted by vesicles, or parts of the placenta are changed into bands or plaques of vesicles. The branches of the umbilical artery leading to these degenerated villi are obliterated. The fetus is often living, sometimes normally developed, sometimes stunted in its growth. 3. *Mola hydatidosa totalis.*—The ovum is a mass of vesicles surrounded by a decidua perforated in numerous places. Remnants of fetal membranes are sometimes found in the midst of the vesicles. Of the fetus no trace is left. 4. Those cases in which a twin-pregnancy exists. One ovum is normally developed, the other one is a shapeless mass of myxomatous villi. Twelve cases are reported in medical literature, one by Kehrer.[1] *Clinical Manifestations.*—There are three very characteristic symptoms of this curious disease—viz. sudden or rapid increase in the size of the uterus much beyond that corresponding to the period of pregnancy; irregular uterine hemorrhages varying in duration from a few hours to several weeks, and in amount from a moderate to an excessive flow; these hemorrhages become more frequent and severe with the growth of the vesicles into the decidua; and the discharge of a serosanguineous fluid containing the peculiar vesicular growths. While the disease may have existed from the first month of gestation, the excessive increase in size is usually not noted until the third or fourth month. At this time palpation of the large and often irregular uterine tumor will reveal a peculiar doughy sensation, with inability to distinguish the outlines of the fetal tumor

[1] *Archiv f. Gynäk.*, Band xlv. Heft 3.

through the walls of the uterine mass, and there is an absence of the fetal heart-sounds. The hemorrhages may be frequent in occurrence and very profuse, or there may be but one hemorrhage rapidly proving fatal. The cysts, upon finding which in the discharge an absolute diagnosis may be made, are of a whitish, sago-like appearance, and are generally surrounded by small clots of blood. According to McClintock, these cysts may be retained *in utero* for months and even years, a few being expelled at varying intervals. Associated with the enlargement of the abdomen are aggravated reflex manifestations, such as excessive nausea and vomiting, a feeling of faintness often aggravated to syncope, and abdominal (in 50 per cent. of the cases), lumbar, or sacral pains; extreme exhaustion may be noted. It is probable that the abdominal pains are caused by the penetration of the villi into the uterine substance. Renal insufficiency with albuminuria and edema of the feet is frequent. A serious complication exists when the cystic change extends through the decidual tissue and involves the uterine wall itself; the disease then assumes a semi-malignant type, and death may result from uterine perforation with septic peritonitis. *Diagnosis.*—The diagnosis will be more or less obscure until the vesicular growths are discovered in the discharge; an absolute diagnosis may then be made. In some cases it may be possible by introducing the finger through the os uteri to distinguish the characteristic grape-like masses. *Prognosis.*—As regards the fetus the prognosis is very grave; usually the ovum is destroyed and in many instances entirely absorbed. The fetal risk is directly proportionate to the extent of villous involvement. The maternal prognosis is by no means good. Over 13 per cent. of women afflicted with this disease will lose their lives. *The causes of maternal death* are exhaustion from hemorrhage, septic infection, and uterine perforation with peritonitis. The disease terminates usually in the fourth or fifth month of gestation, a premature expulsion of the

diseased ovum being favored by the excessive growth and consequent over-distention of the uterus and by the irritation produced by the penetration of the vesicles into the uterine substance. *Treatment.*—Immediate evacuation of the uterine contents is the proper course to pursue. The woman being anesthetized, after thorough disinfection of the vulva and vagina the os may be stretched by Hegar's dilators or Barnes's bags, and when sufficient dilatation has been effected the diseased product of conception should be removed by the finger or the placental forceps; the curet should not be used for fear of the possible involvement of the uterine wall with resulting danger of perforation. After the contents have been evacuated an intrauterine douche should be given and an iodoform-tampon introduced into the uterus; the woman may then be treated as a puerperal patient. Full doses of ergot may be exhibited for some days after the removal of the mole. If the only symptom presented be hemorrhage, it should be controlled by the use of tampons, rest, and opiates. If the lochia become fetid intrauterine antiseptic douches will be required.

(3) *Fibromyxomatous Degeneration of the Chorion*, or *Myxoma fibrosum.*—This is a still rarer affection of the chorion than the preceding, limited usually to the placental portion, and occurring in the later stages of gestation. It consists in a fibroid degeneration of the connective-tissue portion of the chorion situated over the placental site, with the formation of small-sized tumors that ultimately take on a myxomatous change. Those portions that undergo the mucous change have a soft, gelatinous feel. Owing to the late development of this disease, fetal life may not be destroyed. The symptoms are obscure, and the diagnosis may not be made until after labor. The *treatment* is symptomatic.

(*c*) **Pathologic Conditions of the Amnion.**—(1) *Amniotitis* (*Amniotis*).—This is a plastic inflammation of the

amnion, characterized by the exudation of a soft, buttery material which, on hardening, causes adhesions between the amnion and certain fetal portions, constituting what are termed the *fetoamniotic bands*. For these adhesions to take place the inflammation must occur early in pregnancy, before there has been a considerable formation of liquor amnii, and while the fetus and its membranes are still in close juxtaposition. Two serious consequences may follow extensive amniotic adhesions—viz. premature detachment of the placenta from traction caused by the fetus during expulsive uterine efforts, and resulting in fetal death and serious maternal hemorrhage; and, secondly, there may be produced the so-called *spontaneous* or *intrauterine amputations* of fetal parts (Fig. 88). A dense band or fold of the amnion may be thrown over a limb of the fetus, and by constricting the circulation may arrest the growth and development of the distal portion, which may be either completely separated or only retarded in its growth and caused to undergo an atrophic process. In case complete amputation is effected the severed member will probably be entirely absorbed if the accident has happened prior to the third month of gestation; if amputation has occurred later in pregnancy, the separated portion may be expelled at the time of labor subsequent to the birth of the child. The theory ascribing intrauterine amputation to constriction produced by twisting of the cord around the fetal limbs is erroneous; such constriction would result in fetal death, from asphyxiation due to interference with the circulation in the cord, long before amputation had been accomplished.

FIG. 88.—Ectromelus (intrauterine amputation).

(2) *Rupture of the Amnion.*—In rare instances the

amnion, for unknown reasons, will become excessively attenuated, so that it will resemble tissue-paper. Any additional stretching will inevitably result in a rupture of the delicate structure, and the over-distended membrane will then retract in bands or strings that may encircle some fetal portion and give rise to intrauterine constrictions or amputations. In other cases, without this pre-existing tenuity rupture of the amnion may take place, with escape of the contained liquor amnii. If the solution of continuity occur low down, in the usual situation, the uterine contents will generally be evacuated; occasionally, however, the rupture takes place at some point near the attachment of the amnion to the placenta, and then, instead of one quick gush of fluid, the liquor amnii will drain away in small quantities from time to time for a period of weeks or months. This constitutes the condition known as *amniotic hydrorrhea*, which must be diagnosed from the ordinary hydrorrhea of pregnancy. Generally, the *treatment* of this condition is inaction, unless abortion be threatened, when measures must be taken to preserve the product of conception; if this be impossible, the usual treatment of abortion must be instituted.

(3) *Oligohydramnios* is an abnormal deficiency in the amount of liquor amnii secreted. This condition is extremely rare, probably not occurring more frequently than once in 3500 cases, and is of pathologic importance only when it is marked in the early months of intrauterine life; it may then result in fetal deformities, such as talipes or bowing of the limbs (due to interference with the growth of the fetus from compression by the uterine walls), or in intrauterine amputations from the formation of feto-amniotic bands with ultimate constriction of one or more parts. If present late in pregnancy, the fetal movements will be more or less painful to the mother, and the labor will be prolonged and difficult on account of the absence of the amniotic fluid.

(4) *Hydramnios, Polyhydramnios,* or *Dropsy of the Amnion.*—This is an excessive secretion of the liquor amnii, a much more common condition than its converse, oligohydramnios; it is said to occur about once in 300 cases of labor. For the sake of convenience in determining when this affection exists an accumulation of two quarts or more of the fluid has been accepted as constituting a true hydramnios. At times the amount of fluid stored up in the amniotic cavity has been very large, as much as six or seven gallons being on record. The disease may be encountered in one of two forms. In rare instances it may be *acute*, the excessive secretion taking place in from one to a few days; more common is the *chronic* form, in which there is a steady accumulation of fluid during a period of several months. *Etiology.*—As to what is the actual cause of this interesting malady no positive statement can be made. It is probable, however, that it most often results from a pathologic state of the fetus, generally syphilis, manifesting itself in some obstruction to the fetal circulation, the obstruction being usually located in the liver or the heart. In consequence of this obstruction there is a great rise in the pressure of the blood in the umbilical veins, the fetal portion of the placenta becomes highly edematous, and through osmotic action the excess of fluid accumulates in the cavity of the amnion. Other theories that have been advanced in an effort to elucidate the matter are these: (1) An excessive secretion of urine on the part of the fetus; (2) pressure upon the umbilical or other veins by a large fetal abdominal tumor; (3) exudation from the fetal skin when the latter is the seat of some pathologic affection, such as nevus or elephantiasis congenita cystica; (4) amniotitis (often the cause of acute hydramnios); (5) deciduitis; (6) multiple pregnancy, resulting in interference with the circulation of the weaker fetus, and consequent hydramnios from placental edema: a fact worthy of note is that occasionally hydramnios is associated with, and perhaps caused by, hypertrophy

of the placenta, the latter attaining a size considerably above the normal; (7) general maternal anasarca, the gravid uterus participating in the condition; (8) exaggerated maternal hydremia; (9) multiparity (according to McClintock hydramnois occurs more frequently in multiparæ than in primiparæ in the proportion of 23 : 5). *Symptoms.*—In the *acute* form the symptoms may be quite marked; there is more or less pain, which often becomes intense; extreme and rapid distention of the abdomen; a moderate rise of temperature, resulting from the acute inflammatory action that is taking place upon the amniotic surface; inability of the woman to assume the recumbent posture; vomiting that may become incessant; profound disturbance of respiration, often amounting to orthopnea, and then accompanied by symptoms of asphyxiation—viz. lividity of the face and irregularity of the pulse and respiration. In the *chronic* form of hydramnios the accumulation of fluid is much less rapid, and is, consequently, unattended by the foregoing severe symptoms. The distention is most commonly noticed about the third or fourth month, and is steadily progressive, giving rise, as a rule, to but little discomfort to the mother. There is a slight disturbance of the general health, the patient feeling somewhat depressed; there is more or less insomnia, resulting probably from the sense of weight—rarely amounting to actual pain—in the pelvic region; associated with these general manifestations are the most important symptoms of the disease—namely, those resulting from pressure. Impeded respiration and palpitation of the heart from upward displacement of the diaphragm; neuralgia of the abdominal walls, pelvis, and lower extremities from pressure upon the pelvic and sacral plexuses of nerves; edema of the genitalia and limbs from interference with the pelvic circulation; the voiding of scanty and albuminous urine from obstruction of the renal circulation; derangements of digestion resulting reflexly from the extreme uterine distention or directly

from pressure exerted upon the abdominal viscera; occasionally the production of ascites from pressure upon the portal vein—all of these troublesome symptoms may occur as a direct result of the great over-size of the uterine tumor. *Physical Signs.—Inspection* shows extreme distention of the abdomen. *Palpation* reveals an immensely enlarged uterus with tense and somewhat elastic walls, while a vague sense of fluctuation may be noticed. The fetus may be readily displaced from one position to another or even completely inverted. On *auscultation* there is either total absence of the fetal heart-sounds, or they are much diminished in intensity by their transmission through the excessive amount of liquor amnii. *Vaginal examination* reveals a high position of the os, with more or less obliteration of the cervical canal; the lower uterine segment is tense, elastic, and at times distinctly fluctuating, while the presenting fetal part can be distinguished with difficulty. *Diagnosis.*—In pronounced cases of hydramnios the correct diagnostication of the condition is by no means a simple matter. It becomes imperative to distinguish between that condition and the presence of ascites during pregnancy, ovarian cystoma, and multiple pregnancy. In the following tables may be found the main points of differentiation—

From *ascites:*

Hydramnios.	*Ascites.*
The uterus may be readily detected as a round, almost spheric mass.	The contour of the uterus is recognized with difficulty.
Percussion gives an area of dulness corresponding to the contour of the uterus, with a tympanitic note in the flanks.	The patient occupying the dorsal position, dulness will be found in the flanks as well as over the pregnant uterus.
Change of position has no effect upon the area of dulness.	The area of dulness varies with a change in the position of the patient.
There is no effusion of liquid elsewhere.	There is usually the coexistence of dropsical effusions in other parts of the body.
The urine is not much decreased in amount, but may contain traces of albumin.	The urine is diminished in quantity and is whitish and turbid.
There is little or no thirst.	There is constant and great thirst.
Distention occurs mainly in the median line.	The hypochondria are much distended.
In hydramnios rapidly developing at the fifth or sixth month (usual time) the umbilicus rarely protrudes.	In extreme ascites the umbilicus is markedly protuberant.

From *ovarian cystoma* (very difficult):

Hydramnios.	*Ovarian Cystoma.*
The uterine tumor is drawn up, and is felt with difficulty by vaginal examination.	The uterus is low down in the pelvis, even though pregnancy coexist (Kidd).
Other signs of pregnancy coexist.	In uncomplicated cases these are absent.
There is a history of pregnancy, with the rapid development of the uterine distention during its progress.	There is a history of gradual and slow development of the growth covering a period of months.
The characteristic blotches of pregnancy are seen upon the face.	The characteristic ovarian facies is present in advanced cases.
Usually the patient is not much emaciated.	The patient ultimately emaciates.

From *multiple pregnancy* (often difficult):

Hydramnios.	*Multiple Pregnancy.*
The uterine tumor is more distinctly tense.	The uterine walls are not so uniformly distended and tense.
Fluctuation may be elicited.	Fluctuation is absent.
There is inability to palpate the fetal limbs.	A number of fetal limbs may be palpated.
The lower uterine segment is unusually distended, tense, and elastic; the presenting fetal part is recognized with difficulty.	There is no undue distention of the lower uterine segment; the presenting part of a fetus may be readily detected.
The fetal heart-sounds are faint or altogether absent.	The fetal heart-sounds are distinct; heart-sounds of different rates, corresponding to the two fetuses, may be heard.

Prognosis.—The *maternal* prognosis, while not grave, is not good; there is manifested a great tendency for the gestation to suffer an early termination from excessive uterine distention, from fetal death, or from premature detachment of the placenta, thus exposing the patient to all the risks of an abortion; the extreme distention to which the uterine walls have been subjected is apt to result in weak and ineffectual labor-pains, thereby causing a prolongation of labor, with subsequent decided inclination to postpartum hemorrhage; the uterus is slow to recover from the effects of the disease, and involution consequently is retarded or perhaps is not fully completed. Death may even supervene from exhaustion, especially in the more acute variety of the disease. The coexistent pathologic condition of the fetus and its appendages predisposes to the development of puerperal sepsis. The *fetal* prognosis is bad, fully 25 per cent. of the children losing their lives. Many of the fetuses are diseased, and present after labor various path-

ologic conditions, such as hydrocephalus, syphilis, or elephantiasis. Death *in utero* is a frequent cause of the termination of pregnancy. In addition to the great prevalence of fetal disease in cases of hydramnios, the high mortality is essentially increased by the notable frequency of funic prolapse and of malpresentations complicating labor and producing death of the fetus. *Treatment.—Acute* hydramnios as soon as diagnosed should be treated by immediate evacuation of the uterine contents. This may be accomplished by perforation of the membranes after dilatation of the os. The danger of the other course suggested by various authors—namely, aspiration of the fluid through the uterine walls—is patent, and the method is to be condemned. Sudden discharge of the fluid should be prevented, and the administration of ergot hypodermically or by the mouth, together with other measures to prevent hemorrhage, should be instituted. *Chronic* hydramnios in the majority of cases requires no treatment other than the application of an abdominal binder and the enforcement of absolute quiet upon the part of the patient in the hope of saving the fetus. Should respiratory or cardiac symptoms appear, or should the patient manifest signs of exhaustion, the pregnancy must be terminated by rupture of the membranes after dilatation of the os. The patient is to be placed upon her back with her hips elevated, and the membranes punctured in the absence of uterine contraction; the fluid should be allowed to flow slowly through the hand of the operator in order to avoid the danger of funic prolapse, syncope from sudden escape of so large a bulk of water, and hemorrhage from premature placental detachment. Every precaution to secure firm uterine contraction and to prevent postpartum hemorrhage must be observed.

(5) *Putrefaction of the liquor amnii* is a rare condition in which there is more or less discoloration of the liquid (from brown to black), associated with an extremely offen-

sive odor resembling that of putrefaction. This is generally an accompaniment of fetal death with decomposition, and in such cases there is also present to a limited degree the formation of gaseous products of putrefaction, constituting a true physometra. It is possible, however, in exceptional cases for this condition to be present and the child still be viable. The cause under these circumstances is unknown, and the condition is only found upon rupture of the membranes during labor.

2. Diseases and Anomalies of the Placenta.

(1) **Placentitis**, or inflammation of the placental tissue, may occur in two forms, the acute and the chronic, the latter including the simple, the syphilitic, and the tuberculous varieties. *Acute placentitis* is an exceedingly rare affection, and is usually a result of septic infection secondary to attempts at criminal abortion, or follows the escape into the uterine cavity of pus from an old pyosalpinx. It is attended with pain, fever, chilly sensations, and more or less prostration, and is, as a rule, soon followed by discharge of the embryo and its appendages, the result of abscess-formation and apoplexies. Of more frequent occurrence is the *chronic* form of the disease. *Simple chronic placentitis* is most commonly the result of chronic inflammation of the decidual cells, and is then termed *placentitis decidualis;* in other cases it appears as a form of arteritis beginning in the larger arteries of the fetal portion of the organ and gradually involving the entire placental structure. As it progresses the inflamed tissues become indurated and undergo fibrous changes, dense adhesions forming between the placenta and uterine walls (*adherent placenta*). The organ is undersized and atrophic in appearance. Abscess-formation is exceedingly rare in simple chronic inflammation of the placenta. *Syphilitic placentitis*, or *syphilis of the placenta*, is, perhaps, the most prolific cause of fetal death. That it is a true inflammatory condition partaking of the gen-

eral nature of syphilis in other organs and tissues—namely, a slow inflammation with connective-tissue formation—is a thoroughly rational view to adopt, notwithstanding the theories of Whittaker and others to the contrary. It is an extremely common and interesting condition, and the placenta will present a varying pathology according to the source of the specific infection (whether maternal or paternal) and the time of implantation of the disease. As a whole, the organ is generally much increased in size and thickness for the period of pregnancy at which it is expelled; it is pale red and anemic in appearance, and its surface is mottled with the yellowish-white patches of diseased tissue. There is an irregular hyperplasia of the connective tissue of the organ, resulting in the formation here and there of dense, though friable, areas. If the disease has had its origin in a syphilitic spermatozoid, it localizes itself especially in the chorionic villi; these become immensely hypertrophied and the seat of cloudy swelling, and are highly infiltrated with granulation-cells that show the peculiar syphilitic predilection for the immediate vicinity of the blood-vessels: as a result of the organization of these cells into fibrous connective tissue the lumen of the blood-vessels becomes obliterated, and the fetus perishes from asphyxiation or malnutrition. If the mother be infected at the same time, the decidua joins in the inflammatory process, and becomes excessively thickened from hyperplasia of the connective tissue; dense adhesions are formed between the placenta and uterus, and these fail to be dissolved by the uterine contractions in labor. If the conception occur in a woman already syphilitic, tertiary manifestations of the disease will be present in the placenta in the form of wedge-shaped gummatous nodules, with their bases situated in the deciduæ and their edges fading off into the fetal portion of the organ. These gummata vary in size from a millet-seed to a walnut, and possess the characteristic structure of gummata elsewhere; they are formed of con-

centric lamellæ surrounding a central zone of soft, yellowish or reddish cheesy degeneration, or an actual abscess-cavity with fatty, pus-secreting walls. They are frequently the seat of fatty and calcareous changes. According to Fränkel, infection of a woman with the syphilitic virus after conception has occurred has generally no effect upon the placenta, which, to all appearances, is normal: this, however, is not an invariable rule. *Prognosis.*—Syphilis of the placenta offers a fatal prognosis for the fetus and a bad one for the mother. The fetus, as a rule, quickly dies of malnutrition from obliteration of the blood-channels. The risk to the mother is greatest at the time of labor; she is then exposed to the dangers of adherent placenta—viz. post-partum hemorrhage and inversion of the uterus from excessive traction on the fundus, together with subsequent septic processes originating in decomposition of retained placental débris. *Treatment.*—If syphilitic infection be suspected during pregnancy, the woman should immediately be placed upon antisyphilitic treatment; especially is the so-called mixed treatment of service in controlling the tertiary manifestations that may be present. If the patient abort notwithstanding these conservative efforts, thorough evacuation of the uterine contents should be effected and attention directed to the avoidance of hemorrhage and other untoward sequelæ. The specific treatment should be continued throughout the puerperium and for some time subsequently. *Chronic tuberculous placentitis*, or *phthisical placenta*, is a form of chronic inflammation of the placenta characterized by the presence of a cellular exudate (miliary tubercles) in the placental lacunæ, the exudate probably coming from the chorionic villi. This material undergoes a peculiar cheesy change closely resembling that which takes place in tuberculous glands or organs, and tubercle bacilli have been detected in it. The vessels of the tuberculous villi are filled with hyaline thrombi, and there occurs a hyperplasia of the endothelium.

(2) **Placental apoplexy** is an effusion of blood behind and within the placental tissue—a very common occurrence in early pregnancy, and the most frequent cause of abortion. *Varieties.*—If the hemorrhage take place before the third month, it will not be confined to the limits of the placenta, but, owing to the lack of union between the chorion and decidua, may force itself between these tissues and spread in the form of an immense clot over the entire outer surface of the chorion. This is termed a *uteroplacental hemorrhage*, and may be recognized after abortion by the peculiar fleshy appearance of the ovum, which is of a dark bluish-black color with a smooth, somewhat polished surface; section of the aborted ovum shows that the amnion and chorion are intact, and the embryo may or may not be found floating in the liquor amnii, according to the period of time that has elapsed between its death and the expulsion of the product of conception: if this be considerable, complete absorption may have occurred. If the decidua has been removed during the process of expulsion, the aborted ovum closely resembles a blood-clot. After the third or fourth month the chorion and decidua have become firmly united, and any effusion of blood now taking place into the placental site is limited by its borders: to this variety of placental hemorrhage Cruveilhier has given the name of *placental apoplexy*. This accident increases in gravity the later it occurs in pregnancy, and in the latter months of gestation it may be attended with a high maternal mortality. Three well-defined forms of placental apoplexy have been described by Jacquemin, as follows: (*a*) The effusion takes place directly into the tissues of one or more of the placental lobes, with the formation here and there of small currant-jelly clots; (*b*) the effusion occupies irregular cavities throughout the placental structure: these are more numerous near the margin of the organ and are surrounded for some distance by an infiltrated and reddened area; (*c*) the effusion occupies a number of regular and clearly-defined cavities of

varying size (from that of a millet-seed to that of a pigeon's egg) not surrounded by areas of infiltration. In course of time these hemorrhagic effusions lose their color and organize into yellowish-white fibrous masses. *Causes of Placental Apoplexy.*—Most commonly does the rupture take place in the maternal portion of the placental tissue, and this is due to some pathologic condition of the mother, such as chronic nephritis, which causes increased arterial tension with congestion of the venous system; under any undue excitement or exertion the weakened venous walls yield and the placental apoplexy is produced. Traumatism, such as a kick or a blow upon the abdomen, may be a cause, and in very rare instances the apoplexy is secondary to some fetal disease, with rupture of one or more of the branches of the umbilical vessels; in the latter case the fetus may become exsanguinated and perish. *Results of Placental Apoplexy.*—The results of apoplexy of the placenta vary according to the size and extent of the hemorrhage. (1) If the effusion be large, the placenta may to a considerable extent be detached; embryonic life is then destroyed and the ovum aborts; (2) if the effusion be extensive, but still not sufficient to cause considerable detachment of the placenta, the embryo will suffer from interference with placental function, and will manifest at birth the signs of malnutrition; (3) if the apoplexy consist only in minute and isolated hemorrhagic exudations, the placental function is unimpaired and gestation proceeds without any alteration in its normal course. The small effusions may undergo fatty, fibrous, or calcareous changes. *Symptoms.*—There are no characteristic clinical manifestations of this interesting pathologic condition: if the effusion be sudden and excessive, there may be present the symptoms of internal hemorrhage—shock; small, feeble pulse; cold, clammy skin; a tendency to syncope; pallor; uterine pain—followed by abortion. Examination of the discharged ovum will then reveal the cause. *Treatment.*—The treatment is that of ordinary abortion. If excessive

hemorrhage has not occurred, and the condition be suspected merely from its previous occurrence in the patient during former gestations, prophylactic measures may be instituted. These will include the observance of absolute rest with limited diet, and efforts at venous depletion, such as the administration of concentrated saline mixtures or, in plethoric patients, the careful performance of venesection.

(3) **Edema of the placenta** is a not infrequent condition dependent upon some interference with the fetal or placental circulation, and consisting pathologically in a serous effusion in and around the chorionic villi, with the formation of small cysts. The placental function is not interfered with by this effusion, and the condition is recognized only upon the discharge of the organ, which is large and friable, of a pale-red color, and soft and juicy on pressure. Placental edema usually follows syphilitic stenosis of the umbilical vein, but may accompany hydramnios or general anasarca in either fetus or mother. There are no clinical manifestations, and consequently therapeutic measures cannot be instituted.

(4) **Degenerations of the Placenta.** — The placenta is subject to various forms of degeneration as follows: (*a*) *Hyaline Degeneration.* — An affection of the maternal portion of the placenta originating in the decidua and extending to the intervillous spaces. It is exceedingly common, nearly every placenta showing some of the white spots of degeneration termed *white infarctions;* these vary in color from grayish-white to yellowish-red, and are circumscribed and firmer than the surrounding tissue, and may reach the size of an English walnut. If present in large numbers or if of excessive size, they may result in fetal death from interference with the placental functions. (*b*) *Fatty degeneration* is a change of a portion—one or more lobes—of the placenta into tissue of a yellowish-white color, friable and greasy to the touch, somewhat denser than the surrounding tissues, and leaving a fatty stain upon whatever it is laid. It results from some

interference with the circulation of the affected part, and is therefore a sequel of placental apoplexy or localized chronic placentitis. Dependent upon the amount of placental tissue involved will be the effect upon the fetus; if moderate in extent, it will manifest itself in a proportionate amount of fetal malnutrition, while, if extensive, fetal death may result. (*c*) *Fibrous degeneration* may follow a fatty change in the placenta, the diseased tissues forming dense adhesions with the uterine walls. When a large amount of both fibrous and fatty tissue is present this condition is termed a *fibro-lipomatous degeneration* of the placenta. Syphilitic gummata may undergo a similar change, or a fibrous placenta may develop from an extensive chronic placentitis of whatever origin. The danger arising from this degeneration is the production of an adherent placenta with probable postpartum hemorrhage. (*d*) *Calcareous Degeneration.*—*Stone placenta* is a not uncommon condition characterized by the presence of sabulous particles in the placenta, in either the fetal or maternal portion, but usually in the latter. The degeneration is frequently localized in the vicinity of the blood-vessels, especially in placentæ affected with syphilis. Stony plates or scales, or even more extensive formations, may be seen in placentæ that have been retained *in utero* for weeks or months after fetal death has occurred. In the usual form occurring during fetal life the placental function remains unaffected. (*e*) *Myxomatous degeneration* or *fibrous myxoma of the placenta* (Virchow) is a change in the placenta characterized by the formation of vascular mucous and fibrous tissue scattered throughout the organ in the form of small neoplasmata. It usually occurs late in pregnancy, and is not necessarily destructive to the fetus. (*f*) *Cystic Degeneration.*—Cysts are of frequent occurrence in the placenta, and are formed either from old placental apoplexies, the solid constituents of the blood being absorbed and nothing but the aqueous portion remaining, or they are the result of inflamma-

tion of the chorionic villi, with effusion of liquid around them; or they may follow a mucoid degeneration of the placenta. They are most common near the central portion of the placenta, never attain any considerable size, and are of no pathologic significance. (*g*) *Pigmentation of the Placenta.*—Very often small areas of pigmentation may be observed scattered throughout the substance of a placenta; these generally result from old placental apoplexies, and are due to the absorption by the surrounding tissues of the hemoglobin of the exuded blood. They have no pathologic significance.

(5) **Tumors of the Placenta.**—Two varieties of placental neoplasmata are noted: (*a*) *Placentoma*, or *placental polyp*, is a hyperplasia of a portion of placental tissue retained subsequent to an abortion. It very frequently happens that portions of the placenta are left in the uterine cavity after abortion, and this persistence has been explained by Pilliet in the following manner: At term the blood-sinuses of the uterine tissue have widened and coalesced so as to form a single layer of blood between the maternal and fetal structures, hence complete detachment of the placenta is readily effected; in abortion the foregoing condition has not developed, and in proportion to its non-development does detachment become more difficult. These retained fragments may either derive nourishment from the uterine vessels and take on renewed growth, or they may gather around them fibrin and blood-clots, which become organized and form large polypoid tumors that have been termed *placentomata*. These give rise to repeated uterine hemorrhages, profuse, mucosanguinolent, and often exceedingly offensive leukorrhea, and attacks of uterine colic. The uterus is large and subinvoluted, and boggy to the touch. The *treatment* consists in thorough uterine curetment and tamponade of the uterine cavity with iodoform-gauze. (*b*) *Destructive placental polyp* is a malignant growth of one or more of the placental villi, showing a tendency to perforate

the uterine wall and even to project into the abdominal cavity. This quickly proves fatal, either from exhaustion, from hemorrhage, or from peritonitis.

(6) **Anomalies of the Placenta.**—Curious anomalous conditions of the placenta have been described. These may be grouped as follows: (*a*) *Anomaly of Size.*—*Placenta membranacea*, a malformation of the placenta resulting from failure of the chorionic villi to atrophy. As a consequence of this defect the placenta forms over the entire chorionic surface as a thin, broad, membranous structure intimately connected with the deciduæ. Such a placenta is frequently adherent. (*b*) *Anomalies of Shape.*—(1) *Horseshoe placenta*, a crescentic form frequently seen when the placenta forms around the internal os, as in placenta prævia, and a common occurrence in twin pregnancy, in which the two placentæ are united by a strip of placental tissue. (2) *Placenta marginata*, a form in which the normal placenta is surrounded by a rim or collar of placental tissue. (3) *Battledore placenta*, one in which there is a marginal, instead of a central, implantation of the cord, whereby the organ assumes somewhat the shape of a battledore or a tennis-racket. (4) *Annular placenta*, one that extends around the interior of the uterus in the form of a belt. (5) *Placenta fenestrata*, one in which there is an absence of the true placental tissue in one or more places, at which points the chorion læve appears as a transparent membrane. (*c*) *Anomalies of Number.*—(1) *Placenta duplex* or *bipartita*, a malformation of the placenta in which it is divided into two portions. (2) *Placenta tripartita*, a malformation in which there are three distinct portions of the organ more or less intimately united. (3) Occasionally, in addition to the usual placental mass, there will be found one or more distinct and separate placental lobes; these are termed *subsidiary placentas* (*placentæ succenturiatæ*). If they do not act as true placental tissue—that is, have no relation to the nourishment of the fetus—they are termed *placentæ spuriæ*, or *false*

placentas. The danger to be feared under these circumstances is the retention of these accessory growths after labor, with resultant hemorrhage or sepsis. (*d*) *Anomaly of Position.—Placenta prævia*, a term applied to that condition in which the placenta is fixed to the portion of the uterine wall that undergoes dilatation as labor advances (the lower uterine segment), so that the placenta precedes the advance of the presenting part of the fetus.

3. Diseases and Anomalies of the Umbilical Cord.

(1) **Disease of the Umbilical Vessels.**—Certain pathologic conditions of the vein and arteries of the cord may be encountered, giving rise to more or less serious interference with fetal nutrition. Thus, there have been noted: (*a*) *Stenosis.*—There may be a congenital narrowing of the lumen of the vessels of the cord, or they may become obstructed as a result of syphilis or other inflammatory disease. The fetus suffers in proportion to the amount of stenosis, and may present an emaciated appearance at birth, or fetal life may even be destroyed. If the vein alone be involved, the placenta becomes hypertrophied, congested, and edematous; if the arteries share in the condition, the fetal circulation will be impeded and the fetus itself will become more or less edematous. (*b*) *Atheroma* quite frequently occurs, but generally does not exert a pernicious effect on the fetus. At times, however, it becomes excessive, and then may give rise to more or less stenosis with resulting thrombosis. The atheromatous condition, which is generally syphilitic in origin, never extends beyond the cord into the fetal body. (*c*) *Arteritis and phlebitis with cirrhosis of the blood-vessels* invariably result in stenosis, and are always sequels of fetal syphilis. This condition is characterized by an excessive hyperplasia of the connective tissue in and around the blood-vessels, and is one of the main causes of fetal death. (*d*) *Varicosities of the Cord.*—This is generally an unimportant condition characterized by the formation of lumps or protru-

sions in the course of the vessels. It sometimes happens that one of these varicose veins will rupture, usually close to the placenta, and a large-sized hematoma will form; in some cases the bleeding will be so excessive as to destroy the fetus. (*c*) *Hypertrophy of the valves* is a rare condition, probably syphilitic in origin, resulting in obstruction to the lumen of the vessels. When well marked, nodules of considerable size may indicate the site of the valves.

(2) **Cysts of the Cord.**—Cystic degeneration of the cord may result from interference with its circulation, with a resultant effusion of serum into the spaces beneath the amniotic sheath and in the allantoic tissue; it may be due to a liquefaction of Wharton's jelly, with an accumulation of the fluid in more or less circumscribed sacs; or it may be a sequel of apoplexies in the cord. It is of no clinical importance.

(3) **Hernia of the Cord.**—This consists in a protrusion of a loop of bowel, or in more aggravated cases of one or more of the abdominal viscera, at the point of insertion of the umbilical cord in the abdominal wall. The extruded viscera are included in a dilatation of the sheath of the cord. The condition may result from one of two causes: (*a*) There may be a failure of the fetal intestine to retract into the abdominal cavity during the process of fetal development; (*b*) the abdominal walls (lateral plates) fail to unite after visceral retraction has been accomplished. In the latter case, as the cord increases in length the intestines are progressively drawn farther out of the abdominal cavity until quite extensive herniæ may be produced. In the majority of cases there is associated with this condition other manifestations of imperfect fetal development, especially of the limbs or lower abdominal regions, and in many instances the fetus is stillborn. The *treatment*, should fetal life be preserved, consists in protection of the protruding viscera by properly-fitted shields or bandages until appropriate operative procedures may be instituted.

Anomalies of the Cord.—Various abnormalities of the cord may be noted. These consist in: (*a*) *Torsion.*—A certain amount of rotation of the arteries around the umbilical vein (ten to twelve twists) is normal, and the fetus is not thereby incommoded. If the torsion should become excessive, however, the umbilical vessels must necessarily become obstructed to a varying degree, and even to the point of causing fetal death. In order to permit this extreme torsion of the cord great mobility of the fetus is necessary, and this can result only from undue length of the funis associated with undersize of the fetus, or from a lax condition of the uterine walls and excessive dilatation of the uterine cavity. From the latter condition may be explained the relatively greater frequency of the complication in multiparæ than in primiparæ. It is the generally accepted view that instances of excessive torsion are found only after fetal death has occurred, and that the torsion itself, induced by active fetal movements, is not the primary condition. The degree to which the twisting may take place under these circumstances is remarkable: the cord may be reduced to the thickness of a strand of ordinary sewing-thread, and the twists may number three hundred or more. It would be impossible for this large number of twists to have occurred during the life of the fetus, as the obstruction produced by one or two twists would have resulted in fetal death long before others had formed (Schauta). A curious fact is the greater frequency of torsion in the cords of male fetuses. When present in a minor degree, the twists are located most commonly in the immediate vicinity of the umbilicus. (*b*) *Knotting.*—In rare instances true knots are found in the cord; usually these are merely loose loops rather than tightly-drawn knots. They are produced by the passage of the child, either before or during parturition, through a loop encircling its body, and are not of much clinical importance; if they should occur during pregnancy, they may become tightly drawn, and death will follow from obstruction of the circulation with

resulting asphyxiation. Occasionally a true surgeon's knot may be found. (*c*) *Coiling.*—It not infrequently happens that during the growth of the fetus its neck or one or more portions of its body will become completely encircled by the cord (Figs. 89–94). This condition was referred to

FIGS. 89–94.—Anomalies of the umbilical cord (McGillicuddy).

by the older writers under the caption of *suicidium fœtus in utero.* This will or will not result disastrously to the fetus according as to whether or not the constriction is tight enough to cause circulatory obstruction or to interfere in any way with the vital functions of the fetus. The coilings never give rise to intrauterine amputations, as was formerly

believed; before such a result could be accomplished the encircling coil would itself undergo such compression that the lumen of the vessels would be obliterated and the fetus perish. A common position for the coils to occupy is around the neck, as many as nine in one case being on record, while one to three coils are of common occurrence; statistics show that coiling around the neck occurs in at least 25 per cent. of all births. Under these circumstances the fetal life is jeopardized during labor, death from strangulation resulting if the coils be not speedily loosened. A shoulder or one or more limbs may be encircled, and the cord be so reduced in length as to cause considerable obstruction to labor. Thus the advance of the child may be hindered, a malposition or malpresentation be produced, or the placenta be prematurely detached and dangerous hemorrhage follow. The *treatment* consists in efforts at relaxation as soon as discovered. This may be accomplished in the majority of cases by gentle traction upon the yielding extremity of the cord; the relaxed loop should then be slipped over the encircled portion. If efforts at relaxation fail and strangulation seem inevitable, a double ligature must be applied and the cord severed between, after which speedy delivery must be accomplished. (*d*) *Tangling.*—In multiple pregnancies it occasionally happens that the cords become twisted or even knotted together; in case of such an accident the almost inevitable result is the destruction of both fetuses from asphyxiation, with ultimate expulsion of the product of conception. (*e*) *Anomalies of Size.*—It is quite a common event to find the cord considerably increased in *length*, even reaching the size of from 180 to 210 cm. (70.8660 to 82.6770 in.); one instance is recorded in which it attained the length of 9 feet. The dangers attendant upon increase in length are the production of coils and knots and funic prolapse at the time of rupture of the membranes. More rare is decrease in the length, although cases have been recorded in which the cord has been extremely short, and even in a few instances practically

absent, as when, for instance, it has measured but 1 cm. (0.3937 in.) in length. The dangers associated with this condition are obstruction to labor from failure of the fetus to descend, and premature detachment of the placenta with resultant hemorrhage. Variations in the *thickness* of the cord have been noted, due to an increase or decrease in the quantity of the jelly of Wharton. In some cases the cord may be found half as thick as a man's wrist. This condition is a matter of scientific interest only, and not of clinical importance. (*f*) *Vascular Anomalies.*—The vascular elements of the cord are subject to great variations both in the number of the vessels and in their distribution. Instead of there being, as normally, two arteries and one vein, the order may be reversed, and there may be two veins with one artery, or in other instances only one of each—of scientific interest rather than of pathologic import. Of more importance are the alterations in placental attachment. Three distinct variations from the normal central implantation of the cord have been noted. In the *marginal* or *battledore placenta* the vessels enter the margin of that organ to be ultimately distributed throughout its structure. The cord is said to

FIG. 95.—Placenta with velamentous attachment of cord (Ribemont-Lepage).

have a *velamentous* insertion (*insertio velamentosa*, Fig. 95) when the vessels pass for some distance between the chorion and amnion before finally entering the placental structure.

This is a condition fraught with considerable danger to the fetus, for the vessels are exposed in their unnatural position to traumatism, and rupture may be followed by serious or even fatal hemorrhage before the delivery of the fetus can be accomplished. An analogous condition is that in which there exists what has been termed, from its resemblance to the suspensory structures of the kidney, rectum, or colon, the *mesocord;* in this anomaly the cord, instead of being directly inserted into the placenta, is received into a fold of the amnion, which it first traverses. This condition does not in any way interfere with the health of the fetus.

4. Pathology of the Ovum in its Entirety.

(1) **Premature Discharge of the Ovum.**—In the preceding pages repeated mention has been made of the untimely termination of pregnancy as directly associated with, or the outcome of, diverse morbid states of the ovum and its appendages. This phenomenon is by far the most common pathologic feature of the childbearing era. No accurate statistics as to the frequency of its occurrence can be offered, but it is a well-recognized fact that the vast majority of married women have once, and in many instances repeatedly, lost an ovum before the full completion of the term of pregnancy. It is also known that one abortion predisposes to others in subsequent pregnancies, and thus the deplorable condition of *habitual abortion* may be inaugurated, the woman showing an apparent inability to carry the fecundated ovum to term. Laying aside the fact that immense numbers of fetal lives are thus annually lost, the subject is one of vital importance on account of the direful maternal sequelæ. The wreck of many a woman's constitution may be directly traced to one, or repeated, abortions, and it behooves him who would successfully combat this accident of pregnancy and avert its unhappy effects to closely investigate the causes, remote or immediate, of any given case, with an aim to their removal, if this be possible.

and to fully equip himself for the proper management of the condition. A well-conducted case of spontaneous abortion may be made to redound tenfold more to the credit of the attending accoucheur than can a dozen cases of simple labor at term.

For accuracy of classification of this vast subject it has been found convenient by writers to divide the cases into three distinct groups according to the period of gestation at which they occur. Thus, expulsion of the ovum during the first trimester of pregnancy—that is, before the formation of the placenta, the most common period—is termed *abortion;* taking place at this time, but little material is retained in the uterine cavity, the ovum generally being expelled entire. If the product of conception be lost at any time in the second trimester, the fourth, fifth, or sixth month—that is, up to the period of fetal viability—the accident is termed a *miscarriage;* in this class of cases the ovum is generally expelled first, and the placenta or portions of it subsequently, and hence arises the danger of sepsis and protracted uterine hemorrhages so constantly encountered at this time. Finally, loss of the ovum after viability of the fetus and at any time prior to its full maturity is termed *premature labor.*

Causes of Abortion.—Numerous as are the causes of abortion, they may all be grouped under two main headings—namely, the *pathologic* and the *incidental.* The former includes all diseased conditions of the parents or of the product of conception that result in its untimely expulsion, while under the latter heading may be classed those accidental or peculiar circumstances that in any given case will bring to a termination a pregnancy that has apparently been until then absolutely normal. Among the *pathologic causes* of abortion may be included—(1) *Certain morbid states of the ovum and fetus,* as apoplexies of the ovum occurring early in the course of gestation; disease of the umbilical vesicle; any inflammation or other abnormal condition of

the deciduæ and other membranes (deciduitis, the various forms of degeneration, atrophy of the decidua, cystic disease of the chorion, dropsy of the chorion, hydramnios); placentitis, placental apoplexy, and the various forms of degeneration of the placental tissue; certain malpositions of the placenta, especially placenta prævia; various abnormalities of the funis, as extreme degrees of torsion or knotting, with stenosis of the vessels; later in pregnancy various diseased conditions of the fetus, as hydrocephalus or syphilis (and here it may be stated that syphilis is responsible for by far the great majority of premature expulsions of the ovum, operating as it does through both father and mother); finally, death of the fetus from any of the foregoing causes, the dead product of conception then acting as a foreign body *in utero*, although a dead embryo may be retained for an indefinite period, even up to or beyond term, as in that rare condition, missed labor. (2) *Certain paternal causes*, most prominent among which should be mentioned syphilis, resulting in the discharge of syphilitic spermatozoa; constitutional exhaustion from venereal excesses and masturbation, resulting in the production of degenerated, illy-formed, and unhealthy spermatozoa; extreme youth or advanced age, in either instance the spermatozoa lacking virility. (3) *Certain maternal diseases*, including any acute, infectious malady, such as smallpox, typhoid fever, the exanthemata, and certain acute cutaneous diseases; *contagious abortion* (a form of septic infection resulting in discharge of the ovum—a frequent occurrence in preantiseptic days, but now rarely encountered); sudden and extreme elevation of temperature, as in certain fevers; various pathologic states resulting in interference with the circulatory exchange of the respiratory gases, as grave valvular lesions of the heart, emphysema, pneumonia, in all of which carbonic-acid gas accumulates in the system and acts as a stimulant to uterine contraction; certain convulsive affections in which the

uterus participates, such as chorea, epilepsy, hysteria, tetany, cholemia associated with renal insufficiency, uremic eclampsia; the systemic action of certain poisons, as malaria—which is especially prone to prematurely terminate pregnancy—sewer-gas, lead, mercury, alcohol, and other drugs; certain alterations in the nutritive functions of the body, as obesity (in which condition the great bulk of the maternal body deprives the developing ovum of the blood that should be devoted to its nutrition, and it, in consequence, perishes) or leukocythemia or anemia from the ingestion of insufficient food, subsequent to profuse hemorrhage, or resulting from sedentary life and lack of proper exercise, the fetus perishing from malnutrition or asphyxiation; certain pathologic conditions of the internal genitalia, including malformations of the uterus, metritis and perimetritis with adherent uterus, excessive rigidity of the uterine fibers (especially noted in old primiparæ), undue laxity of the cervical tissues, uterine displacements (especially retroflexion and prolapsus), excessive hyperemia of the uterus and pelvic organs from any cause whatever, severe cervical laceration, exaggerated ulceration and erosion of the cervix, certain tumors of the uterus (fibroids and mucous polyps), diseases of the uterine appendages, such as salpingitis (rupture of a pus-tube is very prone to occur during pregnancy, and may result not only in abortion, but also in the production of a septic peritonitis), ovaritis or ovarian cyst, and inflammation of adjacent organs (proctitis, cystitis, and appendicitis). The *incidental causes* of abortion are also very numerous, and include—(1) All forms of traumatism, such as blows or falls, the lifting of heavy weights, the wearing of tight clothing, tight lacing, the injudicious passage of a uterine sound during a gynecologic examination, excessive and uncontrollable action of the abdominal muscles, as in severe and persistent vomiting, hiccoughing, coughing, or sneezing, excessive laughing, any form of violent exercise, local medication of the cervix uteri, or

excessive coitus. (2) The acquired habit of aborting (*habitual abortion*), in which, when a woman reaches a certain stage in the period of gestation, she manifests a strong tendency to fall into labor-pains and expel the product of conception. (3) Various reflex causes, such as severe mental shock, violent emotions (fear, joy, sorrow); any irritation of the mammary glands, as during excessive lactation; the irritating action of intestinal worms; the performance of minor surgical operations upon any portion of the body; multiple pregnancy, causing reflex contraction of the uterus from over-distention of its walls; any trivial exertion acting upon an exceedingly neurotic disposition, as manifested by a marked tendency of the uterus to contract under the slightest stimuli (the so-called *irritable uterus*): in women of such a neurotic disposition the action of a simple laxative or purgative drug, the jolting of a carriage or a railway-car, the taking of a long walk, sea-bathing, or the advent of a menstrual epoch may initiate uterine contractions of sufficient magnitude to cause expulsion of the product of conception. (4) Finally, under this heading must be placed the various forms of criminal abortion as produced by the use of instruments passed through the cervix, or by the ingestion of certain drugs, such as ergot, ustilago, savin, pennyroyal, or tansy.

Symptoms of Abortion.—The symptoms vary according to the stage to which gestation has advanced. (1) Early abortion, also called *ovular abortion* (Guillemot), occurring within the first three weeks of gestation, is characterized by a flow of blood attended with little or no pain. The history of an absence of the catamenial flow at the preceding menstrual epoch, together with the simultaneous appearance of some of the signs of pregnancy, is strongly presumptive evidence of the existence of gestation; if after this suppression of from five to six or seven weeks there is a return of the discharge with greatly increased flow lasting for some days over the normal duration of the menstruation, and accom-

panied by the escape of numbers of dark clots of varying size and consistence, a diagnosis of abortion may be safely made. In these early abortions the ovum may frequently escape detection owing to its extremely small size. The pain is very slight, probably not more than a backache such as would attend a menstruation; it does not assume the characteristic bearing-down quality of labor-pains of a later period of gestation, and is dependent upon the passage of blood-clots through a contracted cervix.

(2) The clinical phenomena of abortion at a more advanced stage—that is, occurring during the second and third months, *embryonic abortion* (Guillemot)—are more marked; they may be classed as prodromal, active, and physical. The *prodromal* symptoms are at the best vague and unreliable: they consist in a sense of discomfort or fulness in the pelvis and about the thighs; sacral pains; a feeling of malaise; anorexia; considerable thirst; headache; a tendency to frequent micturition with vesical tenesmus; possibly a desire to defecate; increased leukorrhea; depression of spirits; coldness of the extremities; chilly sensations; pallor of the face; and at times a slight rise of temperature. The *active* symptoms are hemorrhage, steadily increasing in amount; uterine contractions; and, finally, expulsion of a part or the whole of the product of conception. The *physical signs* are very important, and vary with the degree to which the abortion has advanced: (1) If the clinical manifestations have just begun to show themselves, the cervix, upon vaginal examination, will be found to be soft and patulous, and possibly the entire cervical canal will be somewhat dilated; the body of the uterus will be felt as an enlarged mass in the anterior portion of the pelvis just behind the symphysis pubis. (2) If the abortion has been in progress for some hours and the clinical phenomena have been steadily progressing in intensity, there will be found a considerable dilatation of the os; Tarnier's sign of inevitable abortion will be present, and probably the finger may

detect the advancing ovum. Tarnier's sign—namely, complete effacement of the angle of anteflexion that in pregnancy normally exists between the upper and lower uterine segments—is produced by the descent of the ovum, which in its course from the fundus to the os straightens the anterior uterine wall. In order to determine whether or not that which the finger detects is an ovum or a blood-clot, *Holl's signs* may be borne in mind. These are as follows: (*a*) During a uterine pain an ovum becomes tense and smooth, increases in volume, and advances, while a blood-clot does not become tense and is compressed without advancing; (*b*) an ovum offers a rounded, elastic extremity, while the blood-clot is non-elastic, solid, and cone-shaped, with the apex below; (*c*) on pressure upon the fundus uteri in case of an ovum the motion is not communicated to the product of conception *en masse*, on account of its elasticity, while a blood-clot, being more solid, would be displaced bodily by such pressure; (3) If the product of conception have escaped before the arrival of the medical attendant, the physical signs in conjunction with an examination of the expelled material will determine whether or not the abortion has been complete or incomplete. In case of *incomplete abortion* the body of the uterus will be large, soft, and boggy; the cervical canal will be found to be quite patulous, permitting the introduction of the finger even into the uterine cavity, while clots, fragments of membrane, or soft, pulpy placental tissue will be detected within the uterus; there will also be present considerable sero-sanguinolent discharge containing dark clots and shreds of tissue, while, if much time have elapsed since the first portion of the ovum was expelled, the discharge will be of a peculiar brownish appearance and will probably emit an extremely fetid odor. In case there has been a *complete abortion*, the body of the uterus will be found to be large, but firmly contracted; the os will be closed, and it will be impossible to introduce the finger through the cervi-

cal canal into the uterine cavity; there will also be present the normal lochial discharge. An examination of the expelled substance—which should always be retained for the physician's personal inspection—may be made by placing it in a vessel containing clear water and removing, in this way, adherent clots and blood. If complete, the deciduæ will be found closely investing the mass, separation having taken place in the spongy or deepest layer of the decidua; in other cases the completeness or incompleteness of the membranes may be demonstrated by floating them upon the water, when any imperfection will be noted.

(3) The clinical manifestations of discharge of the ovum between the fourth and sixth months inclusive (*miscarriage*) are more pronounced. There is now an exaggeration of all the foregoing symptoms, an increased flow of blood, severe bearing-down pains, and more decided uterine contractions. There is a considerable secretion of liquor amnii by this time, and during one of the uterine contractions the membranes may yield and a gush of water follow. The examining finger may also detect the advancing fetal part. In other instances the entire product of conception—embryo, membranes intact, contained liquor amnii, and placenta—may be expelled *en masse*. More usually there is apt to be retention of some of the placenta, with profuse hemorrhage and increased danger of septic processes from decomposition of the retained masses, or ultimate development of placentomata.

(4) The clinical phenomena of *premature labor* are in every respect identical with those of labor at term.

Duration of Abortion.—The time consumed in an abortion varies considerably in different women. If, as occasionally happens, the entire product of conception escape upon the first appearance of the clinical phenomena, as following a severe jar or fall, this is termed an *instantaneous abortion;* in other cases, and much more frequently, there is a gradual discharge of the ovum and its

appendages, covering a period of days, weeks, or even months, until, in some instances, the patient becomes almost exsanguinated; such a state of affairs should be arrested by mechanical interference on the part of the accoucheur. On the whole, it may be said that the average duration of abortion, as commonly met with, is from twenty-four to thirty-six hours.

Diagnosis of Premature Expulsion of the Ovum.—(1) *Of Abortion.*—A sudden uterine hemorrhage, attended or not with pain according to the stage to which gestation has advanced, and following suppression of menstruation for a variable period, during which time there have been present one or more of the recognized early signs of pregnancy, is sufficient ground upon which to base a diagnosis of threatened abortion. When, however, on being called in to see a patient presenting such a history, or who states that there has been in addition the discharge of clotted material in a small or considerable amount, quite another and exceedingly delicate question of diagnosis is involved. It then becomes incumbent upon the medical attendant to determine by physical investigation of his patient, together with careful examination of the expelled masses, whether he has on his hands merely a threatened abortion with every possibility of saving the product of conception, or an abortion so far advanced that it is inevitably bound to continue notwithstanding the most conservative efforts on his part; or, on the other hand, whether there has already occurred a complete or partial expulsion of the ovum. In the following table the main characteristic features of these different forms or periods of abortion are delineated:

Threatened Abortion.	*Inevitable Abortion.*	*Incomplete Abortion.*	*Complete Abortion.*
Hemorrhage is free, bright-red, persistent, and free from clots.	Hemorrhage is persistent, increasing in amount and containing clots and fragments of the ovum.	There are repeated attacks of hemorrhage, at times profuse; often dark, grumous, and very offensive.	There is a complete arrest of hemorrhage.

Threatened Abortion.	*Inevitable Abortion.*	*Incomplete Abortion.*	*Complete Abortion.*
Pain is slight or entirely absent.	Pain progressively increases in severity.	Occasional attacks of uterine colic.	Absence of pain.
Discharge consists only of pure blood.	Discharge consists of blood and portions of the ovum.	Examination of the expelled material shows imperfections in the membranes.	Discharge is the normal lochia, gradually terminating in a leukorrhea.
Os is somewhat dilated, but not freely patulous.	Os is well dilated and admits the finger, which may feel the advancing ovum.	Os is quite patulous; the finger detects shreds of membrane, masses of placenta, and blood-clots.	Os is closed.
Uterus is soft, large, boggy, anteflexed; vaginal vault is tense.	Uterus is anterior, but shows Tarnier's sign.	Uterus is persistently large and soft, and is not undergoing involution.	Uterus is hard, enlarged, but firmly contracted; involution is normal.
Signs of pregnancy, other than suppression, are present.	There is an arrest of the signs of pregnancy.	Subsidence of all the signs of pregnancy other than enlargement of the uterus.	Subsidence of all the signs of pregnancy.

(2) *The diagnosis of miscarriage* may be made by a history of the case showing that the pregnancy had advanced to or beyond the fourth month, by the presence of the liquor amnii, by the possibility of recognizing the advancing fetal part, by the greater severity of the symptoms, by arrest of the signs of pregnancy, and possibly by the development of the mammary secretion.

Prognosis of Premature Expulsion of the Ovum.—The maternal prognosis is a matter of grave import and embraces a number of possibilities. In spontaneous abortion the mortality is very low; the dangers consist in hemorrhage, peritonitis from extension of inflammation from the uterus, and sepsis from retention of portions of the ovum. The immediate hemorrhage is not likely to result fatally, but the patient very frequently suffers from its remote effects: she remains weak and anemic, and even forms of pernicious anemia resulting fatally have been known to follow. Secondly, a woman having once aborted there is manifested a peculiar tendency to a repetition of the act in a subsequent pregnancy, and the habit of abortion may be formed. According to Napier of London, at least 18.6 per

cent. of the women who miscarry are habitual aborters. Kortright says that "repeated abortions occur commonly either at the beginning or at the end of the childbearing period. When occurring soon after marriage they indicate lack of development of the sexual organs. When occurring late in life they indicate exhaustion of the power of reproduction."[1] Again, Napier declares that of 100 women that miscarry, 22 will remain sterile, and of these 14 will have painful and incurable pelvic disease, and 8 will not suffer, but will be barren. Finally, there may be retained in the uterine cavity fragments of placental tissue which, becoming organized or receiving upon their surfaces large deposits of blood-fibrin, develop gradually into placentomata or placental polypi of various forms, flat or acuminate, that give rise to severe endometritis, subinvolution, and profuse hemorrhages; the health of the woman then becomes impaired or even permanently lost.

Treatment of Abortion and Miscarriage.—This may be divided into prophylaxis, the treatment of threatened abortion or miscarriage, the treatment of the inevitable form, and the after-treatment.

(1) *Prophylactic Treatment.*—If, for any reason, premature expulsion of the ovum is to be feared, as when the mother is the subject of some systemic disease such as syphilis, or when there exists a chronic form of local disease, as an aggravated endometritis, or when there has been manifested a tendency to habitual abortion, strenuous measures must be adopted to conserve the product of conception. In all such cases the patient should be instructed to observe especial precautions, such as the avoidance of over-exertion, as the lifting of heavy weights or the reaching for objects above her head, especially at the time when the menstrual epochs would occur did pregnancy not exist, or at the period of gestation at which previous abortions have taken place; the taking daily of several hours of rest in the

[1] *Brooklyn Med. Jour.*, Sept., 1894.

prone position; the avoidance of sexual intercourse or other causes of pelvic congestion, and of the various disorders of digestion; and the importance of properly regulating the bowels without resort to purgative medicine. It is well during the time for the menstrual epoch for the woman to remain in bed for five or six days. In addition to these measures, which it becomes the special duty of the patient herself to institute, there are various prophylactic measures that the physician should take pains to put into operation. Thus, a retrodisplaced uterus must be replaced and held in position by a properly-fitting pessary until the natural growth of the organ will carry it above the promontory of the sacrum. If there be known to exist an endometritis or a severe laceration of the cervix, appropriate treatment should be instituted in the period prior to impregnation, in order to bring the organ into as perfect a condition as possible for the subsequent pregnancy. A woman affected with syphilis should be placed upon a strong course of mercurials, or preferably the mixed treatment, before and during the continuance of her pregnancy. Mercuric protiodid may be given in from $\frac{1}{24}$ to $\frac{1}{8}$ of a grain thrice daily in association with potassium iodid in from 10- to 30-grain doses, or the potassium salt may be administered internally in conjunction with inunctions of mercurial ointment or of mercuric oleate.

(2) *Treatment of Threatened Abortion.*—If there be every reason to believe that the ovum is in a healthy condition and that the threatened discharge is due to some one of the incidental causes of abortion, a conservative line of treatment must be instituted. If, however, the woman be suffering from one of the acute infectious diseases, the abortion must be regarded as nature's effort to throw off a portion of the disease, and steps must be taken to empty the uterus as rapidly as possible. The same line of treatment should also be pursued if the fetus be known to be dead, as when there is associated with the hemorrhage a grumous and

offensive discharge. Efforts to arrest a threatened abortion consist in absolute quiet and rest in bed in a darkened room with the head lowered. Nerve-sedatives should be administered in large doses—preferably opium, or chloral, potassium or sodium bromid, and the fluid extract of viburnum prunifolium. Opium should invariably be administered, either in the form of laudanum in from 15- to 20-drop doses, or chlorodyn in doses of 10 minims, or better by suppository containing 1 grain of the aqueous extract morning and evening, or by hypodermic injections in the abdomen of from $\frac{1}{12}$ to $\frac{1}{8}$ of a grain of morphin. Its action may be supplemented by the use of large doses of the fluid extract of viburnum prunifolium—1 dram four times daily (Jenks, Hirst). If the threatened abortion be due to an accumulation of carbonic-acid gas in the maternal blood, inhalations of oxygen may be given with excellent results, or oxygenation of the blood may be secured by the administration of large doses of potassium chlorate—20 grains thrice daily (Lusk, Fordyce Barker, Sir J. Y. Simpson, R. A. F. Penrose). After the bleeding has been arrested the patient should be confined to bed for a week or two in order to secure absolute rest and quiet.

(3) *Treatment of Inevitable Abortion.*—When, after such a course of treatment as the foregoing, the symptoms steadily grow worse and portions of the decidua or other tissues are cast off, it may be decided conclusively that an inevitable abortion is to be dealt with, and a corresponding plan of treatment must be adopted. In the management of this condition one of two methods may be followed. The first and better method is that known as the *active treatment*, which consists in immediate evacuation of the uterine contents; while the other is the *expectant plan*, and consists in the repeated use of vaginal tampons in combination with the internal administration of ergot, in the hope that Nature herself may throw off the product of conception. The steps of the *active treatment* of inevitable abortion may be

stated as follows: (1) *The introduction of a vaginal tampon* to control the bleeding and to favor dilatation of the os and expulsion of the ovum. The tampon should consist of small pieces of antiseptic wool or sterilized cotton, or of strips of iodoform-gauze introduced through a vaginal speculum; it should be carried well back of and packed tightly around the cervix; the entire vagina must be filled with the tampon and a T-bandage then applied. If the bleeding be very excessive and fears be entertained for the safety of the patient, a strip of iodoform-gauze or a number (from twenty to twenty-five) of small balls of iodoform-cotton the size of the end of the little finger may be introduced into the uterine cavity. In some instances the ovum may be discharged without rupture of the fetal membrane having occurred, and in such cases the hemorrhage is so slight that a vaginal tampon is not required. (2) *Removal of the tampon at the expiration of from eight to ten hours and the introduction of a second tampon*, if this be necessary. One tampon may suffice to accomplish the expulsion of the ovum, and, if so, all further active treatment will be unnecessary. If a second tampon be required, a vaginal douche of mercuric chlorid (1:4000) must be given, and the tampon introduced as before and allowed to remain for a second period of from eight to ten hours. If on the removal of this tampon there be still no sign of the discharge of the ovum, more vigorous measures to secure its expulsion must be adopted. It is at this point that the *expectant plan* of treatment is recommended by some obstetricians, who claim that all manual interference should be avoided, so that, if possible, the membranes may escape rupture, and hemorrhage thus be prevented, and that final expulsion of the product of conception should be accomplished by administering internally repeated doses of the fluid extract of ergot, while successive tampons are applied in the vagina; the patient under this treatment should be strictly confined to bed, and occasional antiseptic vaginal douches given,

careful watch being maintained for the slightest sign of sepsis. In case this should appear or should the hemorrhage become very severe, steps may then be taken to empty the uterus. The objections to this expectant plan of treatment are—(*a*) The length of time that may elapse before expulsion of the ovum, thus considerably augmenting the risk of sepsis, and imposing upon the patient a long and tedious course of vaginal manipulations; (*b*) the strain upon the physical and mental powers consequent upon a prolongation of the clinical phenomena; (*c*) the danger of the production of irregular uterine contraction from the administration of the ergot, with retention of a portion of the uterine contents. In all cases in which, after the introduction of the second tampon, there is still a retention of the ovum, it is infinitely better to at once proceed to energetic measures to empty the uterus. The succeeding steps of the active treatment will then be as follows: (3) *etherization of the patient;* (4) *dilatation of the os* by means of Hegar's dilators; (5) *removal of the retained ovum* by one of the following methods in the order given: (*a*) *Introduction of the right forefinger into the uterine cavity*, the hand being inserted into the vagina, with counter-pressure by the left hand placed upon the abdominal wall immediately over the symphysis pubis. This method requires considerable time and patience for its successful performance, but is probably the best that can be adopted; (*b*) *the placental forceps* (Thomas's); (*c*) *the uterine curet*, which should be employed with extreme care, in order to avoid perforation of the spongy uterine wall; (*d*) *Hoening's Method of Expression.*—This is a modification of Credé's method of extraction of the placenta, and is performed thus: With the anesthetized patient resting in the dorsal position, two fingers of the left hand are carried to the cervix and vaginal vault, while the fingers of the right hand grasp the uterus through the abdominal walls and squeeze out its contents by strongly compressing the fundus. The

advantage of this maneuver, if it can be successfully managed, lies in the fact that there is no manipulation of the interior of the uterus; it is painful and difficult to perform, however, and a considerable portion of the decidua is likely to be retained even after thorough compression. The method cannot be strongly recommended; (6) *thorough flushing of the uterine cavity* with warm sterilized water to remove fragments and débris; (7) *the application of Churchill's tincture of iodin to the uterine cavity;* (8) *the introduction of a strip of iodoform-gauze to the fundus uteri, and vaginal tamponade,* which should be removed at the expiration of from ten to fifteen hours.

(4) *After-treatment.*—The subsequent treatment of abortion is in every respect the same as that following normal labor. Immediately after the operation hot bottles should be applied to the feet and limbs of the patient, and the head kept low until reaction takes place. After the removal of the gauze further tamponade is generally unnecessary. If the patient have lost sufficient blood to cause pronounced anemia, hot drinks and small amounts of alcoholic stimulants will be indicated. Later, to counteract the constitutional debility, a nutritious diet, with the addition of tonics such as iron, quinin, and strychnin, will be beneficial. Involution may be favored by rest in bed for two or three weeks, together with small doses of ergot—10 drops thrice daily—and retrodisplacement of the enlarged uterus guarded against by avoidance of prolonged dorsal decubitus. During convalescence a change of air will be exceedingly beneficial.

Treatment of Miscarriage.—This is in every respect identical with the treatment of labor at term.

THE INDUCTION OF PREMATURE EXPULSION OF THE OVUM.—It occasionally devolves upon the obstetrician, because of various pathologic states of the mother or fetus inimical to their existence, to prematurely terminate the progress of a gestation. Such a proceeding, involving as it frequently

does the destruction of human life, is necessarily one of extreme gravity, and should be entered upon only after the most judicious thought and counsel. The principle embodied in this serious operation, however paradoxical it may at first sight seem, is one of conservatism: the lesser of two evils is chosen, and the more unimportant life sacrificed for the more important. The supreme law of operative obstetrics is preservation of the maternal life at all hazards, if need be by destruction of the fetus itself; this procedure, however, must ever be regarded as the *opération en réserve*, only to be resorted to when it becomes patent that other methods would be futile or even reprehensible. Here, again, arises the question as to just when it becomes proper to take the initiative. While it is probable that many fetal lives are unnecessarily destroyed by a too precipitate adoption of extreme measures, it is just as evident that a certain proportion of women annually perish from an unwarrantable delay in the institution of an energetic course of treatment. There are some cases in which the pregnancy must be terminated so early in its course—prior to the period of fetal viability—that all thought of preservation of fetal life is excluded; the line of treatment to be pursued in these cases is plain, and the termination of the gestation during this period—before the seventh month—is termed the *induction of abortion.* When it becomes imperative to end the pregnancy after fetal viability and before the normal term of fetal maturity, two lives are to be taken into consideration, the question becomes more complex and serious, and the operation is termed the *induction of premature labor.* It is in this latter period that the danger of a too protracted delay in the adoption of operative procedures is to be anticipated. The most common time for the induction of premature labor is from four to eight weeks before term, at which time all the diameters of the fetal skull are about 1 cm. (0.3937 in.) shorter than at term. According to the investigations of Budin, Ahlfeld, Stolz, Tarnier, and others,

the most important diameter of the fetal head—the biparietal—presents the following measurements during the last trimester of pregnancy: At the seventh month, 7 cm. (2.7559 in.); at seven and a half months, 7½ cm. (2.95275 in.); at eight months, 8¼ cm. (3.248025 in.); at eight and a half months, 8¾ cm. (3.444875 in.); and at nine months, 9¼ cm. (3.6417 in.). The advantage to be derived by the induction of a premature labor in certain degrees of pelvic contraction becomes evident from a study of these figures.

Indications for the Induction of Premature Expulsion of the Ovum.—(1) *Of Abortion.*—The induction of abortion is indicated when maternal life is menaced by some grave pathologic state of the fetus or of the mother. The *fetal indications* are—(*a*) *Certain grave affections of the fetal appendages*, as cystic disease of the chorion and the acute form of hydramnios; (*b*) *embryonic death*, as evidenced by an arrest of the signs of pregnancy and a cessation of, or a decrease in, abdominal distention. More numerous are the *maternal indications*. These include—(*a*) *certain pathologic conditions of the genitalia*, as the presence early in pregnancy of large tumors in the uterus or pelvic cavity; incarceration of a retroflexed or prolapsed uterus; undilatable cicatricial atresia of the cervix or vagina; irreducible hernia of the gravid uterus; advanced cervical carcinoma; extreme pelvic contraction (6 cm.—2.3622 in.—or under); (*b*) *certain grave general pathologic conditions*, as pernicious anemia, pernicious vomiting, progressively increasing albuminuria, chronic nephritis with or without albuminuria, the major form of chorea, certain forms of insanity, as acute mania and pronounced melancholia. (2) *Of Premature Labor.*—The indications for the induction of premature labor include all conditions menacing fetal or maternal life, as well as those pathologic states of either mother or child that will, if the pregnancy be allowed to continue to term, be productive of grave degrees of dystocia. Again, adopting the foregoing classification, the *fetal indications* are—(*a*) Habit-

ual oversize or premature ossification of the upper portion of the fetal skull, as evidenced by previous pregnancies; acute hydramnios occurring late in pregnancy; (*b*) habitual death of the fetus during the last days or weeks of pregnancy, and usually due to placental degeneration (nonsyphilitic); (*c*) fetal death from any cause. The *maternal indications* are—(*a*) *Certain pelvic deformities* that would prevent normal delivery at term, as minor degrees of contracted pelvis (from 9½ to 8 cm.—3.7401 to 3.1496 in.); (*b*) *placental anomalies,* as placenta prævia; (*c*) *grave systemic disease*, as pernicious vomiting, pernicious anemia, increasing albuminuria, eclampsia, dyspnea from extreme ascites, grave valvular disease of the heart, advanced pulmonary tuberculosis, tumors in the pelvic canal.

Methods of Inducing Abortion and Premature Labor.—(1) *Abortion.*—Various methods have been suggested for emptying the uterine cavity during the early (first four) months of pregnancy. Those that have met with more or less universal favor are the following: (*a*) *Cervical and vaginal tamponade.*—This consists in the following steps: 1. *Thorough asepsis of the vaginal tract* by means of a douche of hot water followed by one of mercuric chlorid (1 : 2000); 2. *Partial dilatation of the cervical canal:* this is accomplished by Hegar's or Ellinger's dilators, dilatation proceeding until the canal will admit the index finger: during this procedure the patient may lie in the lithotomy or the Sims posture; 3. *Tamponade of the cervix and vagina.* There is introduced into the cervix, past the internal os, a strip of iodoform-gauze; this should be from 2 to 3 feet long and about 1 inch wide; it should be tightly packed into the cervix, and the vagina filled with another strip of gauze or with antiseptic wool; 4. *Removal of the gauze* at the expiration of from twelve to twenty-four hours. If necessary, after an antiseptic vaginal douche, a small piece of the decidua may be torn away by the placental forceps and another tampon introduced and left *in situ* for from eight to ten hours; if at

the expiration of this time the ovum has not been discharged, the following method must be adopted: (*b*) *Rapid dilatation of the cervix and immediate removal of the ovum* by the placental forceps and curet. This method may be employed in preference to the preceding in cases of great urgency; it is possible thus to empty the uterus in from fifteen to twenty minutes. The steps of the method are as follows: 1. *Thorough asepsis of the vagina;* 2. *Rapid dilatation* by means of the Goodell dilator to an extent of from 2 to 2½ cm. (0.7874 to 0.98425 in.); 3. *Removal of the bulk of the ovum and membranes by the placental forceps;* 4. *Thorough curettage of the uterine cavity. After-treatment of Induced Abortion.*—The after-treatment varies but slightly from that of an ordinary labor. It includes—1. Douching of the uterine cavity with hot sterilized water; 2. Introduction to the uterine fundus of a strip of iodoform-gauze, to be removed in from twenty-four to forty-eight hours, when a vaginal douche should be given; 3. Confinement of the patient to bed for the normal period after childbirth, with the usual puerperal diet.

(2) *Premature Labor.*—The induction of premature labor may be accomplished by one of several methods, as follows: (*a*) *Simpson's or Krause's Method—Catheterism of the Uterus.*—The steps of this method, which acts by causing a partial separation of the membranes from the uterine wall, are as follows: 1. *Thorough asepsis of the vagina* by a douche of mercuric chlorid (1 : 1000 or 2000). 2. The patient, if a primipara, should be placed in the lithotomy position; if she be a multipara, the Sims posture is preferable; the hips should extend well over the edge of the bed or table. 3. *Introduction of a sterilized bougie*, preferably of hard rubber and in size No. 17 of the French or No. 12 of the American scale, in the following manner: The index finger of the left hand is introduced into the vagina and made to impinge upon the mouth of the cervix; the bougie, well oiled, is passed along the finger through the cervix and into

the uterine cavity for a distance of from 15 to 20½ cm. (5.9055 to 8.07085 in.); in its upward course it passes between the deciduæ vera and reflexa, and if introduced upon the side of the uterus opposite to that upon which is situated the placenta, hemorrhage from detachment of the latter will not occur. The balance of the bougie is bent upon itself in the vagina and held in position by means of a tampon of iodoform-gauze. 4. If labor-pains have not supervened at the expiration of twelve hours, a second bougie may be introduced beside the first, after removal of the tampon and the administration of a vaginal douche. Usually labor will be established in from twenty-four to thirty-six hours. 5. *Artificial Dilatation of the Os by Barnes' Bags.*—At the expiration of thirty-six hours the cervical tissues will have been materially softened. The bougies may then be removed and Barnes' bags in successive sizes introduced as follows: The smallest bag of the series (Fig. 96) should be well oiled, doubled laterally upon itself, and introduced into the cervix by means of dressing-forceps, the patient occupying the lithotomy position at the side of the bed; by means of an ordinary household or Davidson syringe the bag may be fully distended with warm water, and allowed to remain *in situ* for from one to three hours, when it may be replaced by the next larger size. To prevent accidental rupture of the bag, with consequent severe or even fatal shock to the patient, she should remain in the dorsal position while the bags are retained in the cervical canal. 6. *Introduction of the hand and the performance of version.*

FIG. 96.—Barnes' bag.

(*b*) *The Expectant Plan.*—This consists in sterilization of the vaginal tract, followed by cervical and vaginal tamponade with iodoform-gauze. The tampon must be renewed daily until labor-pains appear.

(*c*) *The Rapid Method.*—This method may be employed in cases of urgent necessity. It embraces the following steps: 1. Rupture of the membranes; 2. Rapid dilatation of the cervix by means of Hegar's dilators, then by Barnes' or Champetier's bags, allowing each of the former to remain *in situ* not more than from ten to fifteen minutes. The bag of Champetier de Ribes is a nonelastic structure of waterproof silk, shaped like an ear-trumpet, and having a capacity of about 17 ounces. By it a dilatation of about 9 cm. (3.5433 in.) can be secured. It is expelled when complete dilatation is accomplished. This bag is superior to Barnes' bags in that it is more readily introduced, but one is required, and it accomplishes a complete cervical dilatation. 3. Introduction of the hand and the performance of version and rapid extraction of the child, or delivery by means of the forceps. If desired, first one finger and then the others in rapid succession may be introduced into the cervix until the entire hand enters the uterine cavity, when version may be performed and the child rapidly delivered. This method is of service in cases of placenta prævia.

(*d*) *Pelzer's Method—Intrauterine Injection of Sterilized* (*boiled*) *Glycerin.*—Recently Pelzer has suggested the employment of intrauterine injections for the establishment of labor-pains. The following are the steps of this method: 1. Thorough vaginal asepsis; 2. The patient is placed in the Sims posture with the Sims speculum introduced; 3. The cervix is held with a volsellum forceps, and 2 ounces of sterilized glycerin are slowly injected high up toward the fundus uteri between the deciduæ vera and reflexa. The instrument used for this purpose is an ordinary Davidson syringe with a No. 10 English catheter (Jewett); 4. Retention of the patient in the Sims posture for at least thirty minutes to prevent discharge of the glycerin. There are two serious objections to the employment of this method—namely, the danger of occasioning fatal glycerin-poisoning (characterized by extreme renal irritation), and the possi-

bility of the introduction of air into the circulatory system. Especially is this method not to be employed in cases of preexisting nephritis.

(*e*) *Denman's Method—Puncture of the Membranes.*—This is a dangerous method, only to be employed in uterine apathy or before fetal viability. The steps are—1. Vaginal asepsis; 2. Introduction of the index finger of the left hand to the cervix; 3. The passage of a uterine sound or other dull-pointed instrument into the os and through the membranes; the liquor amnii must escape slowly. The *objections* to this method, according to Playfair, are—1. Labor frequently does not ensue for some hours or days; 2. Fetal life is greatly imperilled by the direct pressure exerted upon the child by the contracting uterine walls; 3. It does away with the hydraulic action of the liquor amnii.

(*f*) *Kiwisch's Method—Vaginal Douches of Cold or Warm Water.*—This requires a number of days for its successful performance, and is also objectionable on account of the danger of inducing fatal shock from entrance of the stream of water into the uterine cavity; it cannot therefore be recommended.

(*g*) *Bayer's Method—Galvanization.*—Bayer employs the constant galvanic current, the positive electrode being placed upon the abdomen over the fundus uteri, and the negative electrode being introduced into the cervix. This method, while probably inducing true labor-pains, does so only after repeated applications of the current, and requires so much time for its performance that it is applicable to but a few cases in which there exists no indication for rapid delivery. In certain other instances two or three applications may be of service in hastening cervical softening, other and more rapid methods being employed after the softening of the tissues has been accomplished.

(2) **Missed Abortion.**—"Missed abortion" is a term applied to that condition in which death of the ovum takes place at some time during the early weeks or

months of gestation, shortly followed by the symptoms of a threatened abortion, which, however, gradually subside without expulsion of the dead product of conception; the latter is retained in the uterine cavity for varying periods of time, even amounting to eight or nine months (McClintock). There may be no clinical manifestations attendant upon this retention of the embryo *in utero*, while, on the other hand, vague symptoms of septic changes may be noted, with general malaise, irregular uterine hemorrhages, and more or less leukorrheal discharge. In addition, there is entire subsidence of all the preexisting signs of pregnancy. The changes that the retained ovum undergoes are interesting to note. If there be rupture of the membranes with access of air, there will sooner or later be produced decomposition of the blighted ovum, with the production of a fetid leukorrhea and some symptoms of septicemia. If, however, rupture have not occurred, the ovum is apt to disappear by absorption, if death take place before the third month; if death have occurred later than the third month, various forms of the so-called *true moles* result, which are in the course of a few weeks or months expelled with all the symptoms of an ordinary abortion, except to a lesser degree. This expulsion usually takes place about the fourth or fifth month, and the mole by that time has probably attained the size of an average orange. *Varieties of True Moles.*—True moles are always the result of conception, and must be distinguished from the so-called *false moles*, which are nothing more than masses of coagulated blood and exfoliated vaginal mucosa occasionally discharged in the course of a membranous dysmenorrhea, and not resulting from the retention of a deceased product of conception. The following varieties of *true moles* have been described: (1) *Ova moles*, or blighted ova, in which the true ova have been dissolved, and merely a bloody mass containing chorionic villi and other membranous and fatty débris remains; (2) *fleshy moles*, or retained products that have died at an early stage of gestation and

have undergone more or less organization into carneous tissue; (3) *placental moles*, consisting mainly of masses of placental tissue (see also Cystic Disease of the Chorion); (4) *decidual moles*, formed entirely of decidual tissue; (5) *vesicular moles*, due to cystic disease of the chorionic villi (*q. v.*). *Diagnosis.*—The diagnosis of this interesting condition can be made only upon the discharge of the mole, together with reference to the history of the appearance of the early signs of pregnancy, the onset of the symptoms of a threatened abortion, and their subsidence, with arrest of the signs of gestation. The *prognosis* is good, and the *treatment* is that of an ordinary abortion.

(3) **Extrauterine Pregnancy.**—This is a generic term indicating that rather frequent and extremely interesting condition, also known as *ectopic gestation* or *extrauterine fetation*, in which there is a development of an ovum at any point without the cavity of the uterus. *Frequency.*—It has only been within the last few years that ectopic gestation has come to be recognized as of frequent occurrence, although just what proportion it bears to normal gestation cannot yet be accurately stated. Probably it occurs about once in from four to five hundred cases, but, owing to the lack of general information on the subject, many cases escape detection altogether, and many others are treated and reported as instances of so-called pelvic hematocele, which in almost half of the reported cases is nothing more nor less than a collection of blood in the pelvic cavity coming from a ruptured extrauterine pregnancy. *Varieties.*—Notwithstanding the fact that some of the leading gynecologists of the day (Lawson Tait, Bland Sutton, and others) advance the theory of the tubal origin of all forms of extrauterine pregnancy, such a view cannot as yet be accepted as a clearly demonstrated truth. Indeed, the accurate record of a few cases of undoubted ovarian and abdominal pregnancies that have occurred in this and other lands would seem to disprove such a sweeping statement, but the

clinical history of this interesting pathologic condition is so undetermined that any dogmatic statement upon these mooted questions would be unbecoming. It would seem better, therefore, to accept the following classification of extrauterine pregnancy, which is that generally adopted, as best expressing the present status of our information upon the subject: 1. *Tubal pregnancy*, including—(1) *Interstitial*, *mural*, or *tubouterine* pregnancy; (2) *tubal* pregnancy proper, the most common variety, including the *intraperitoneal*, *intraligamentous*, and *extraperitoneal* forms; and (3) *tuboovarian* pregnancy; 2. *Ovarian* pregnancy (exceedingly rare); 3. *Abdominal* pregnancy, including—(1) the *primary* (exceedingly rare) and (2) the *secondary* form, the latter resulting either from a ruptured tubal (*tuboabdominal* pregnancy) or more rarely from a ruptured interstitial pregnancy (*uteroabdominal* pregnancy). In rare instances there may be present at one and the same time both an intrauterine and an extrauterine pregnancy; in other cases an extrauterine pregnancy in one tube may in a very short space of time be followed by a similar condition in the opposite tube. Very exceptionally there has been noted a plural (twin) pregnancy in one of the Fallopian tubes, and one case is reported (Bloom) of a simultaneous tubal pregnancy on both sides. These are all to be regarded as pathologic curiosities, so great is their rarity. *Etiology*.—The true causation of extrauterine pregnancy is still a matter of uncertainty. Owing to its almost constant occurrence in a certain class of women there have been described as predisposing factors in its development *age* and *sterility*. The condition is generally encountered in women who are between twenty and thirty years of age, and who present the history of a protracted period of sterility following one or more pregnancies. It is probable that the sterility is itself not the cause of the extrauterine pregnancy, but that both conditions result from the same cause located in the Fallopian tubes, and that this cause, whatever it may

be, is most prone to manifest itself at the stated age. From a careful physical and microscopic examination of a large number of tubes removed for this condition it is now generally conceded that some pathologic state of that structure has preceded the obstetric condition probably for months or years, causing an insurmountable obstacle to the passage of the fecundated ovum: these abnormal conditions, which may be regarded as the true etiologic factors in the production of ectopic pregnancy, may be grouped under two main classes—namely, *pathologic conditions of the tube* and *malformations of the tube*. The former class includes all such inflammatory conditions as will, from the resulting hyperplasia or neoplasmic growth, result in occlusion, more or less complete, of the lumen of the organ. Most commonly this is some form of salpingitis, especially the catarrhal and gonorrheal forms, which by causing an exfoliation of the ciliated epithelium and a cellular infiltration of the remaining tissues of the tube—the latter resulting in a lack of the normal peristaltic motion—prevent the proper transmission of the ovum to the uterine cavity. Not infrequently, however, small mucous polypi block up the channel, or bands of peritoneal adhesions consequent upon perimetritic inflammation so constrict and distort the yielding structure as to totally obstruct its lumen or form pocket-like dilatations, into one of which the ovum drops. Any abdominal tumor, as a uterine fibroid, an ovarian cystoma, or a renal neoplasm, may so compress the tube in its growth as also to occlude its lumen to an extent sufficient for the production of this disease. The possible participation of emotions, fright, or shock in the production of extrauterine pregnancy by inducing a temporary spasmodic stricture of the tube is suggested by some writers, but nothing positive is known in regard to this. Under such circumstances as the foregoing it will be impossible for the ovum, already fecundated, to find its way to its normal nidus, and it lodges where first it encounters

the obstruction. Various *tubal malformations*, as congenital stenosis or the existence of diverticula, or even of blind accessory tubal canals, may also very readily result in an ectopic pregnancy. As to what is the cause of the rare forms of the disease, the ovarian and primary abdominal, absolutely nothing positive is known.

Pathology of the Various Forms of Extrauterine Pregnancy.—(1) *Tubal Pregnancy* (Fig. 97).—In this, which is by far

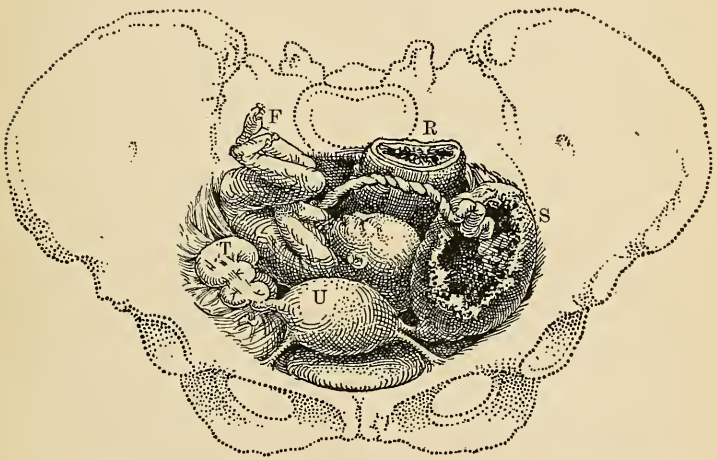

FIG. 97.—Ruptured left tubal pregnancy, fetus still attached and lying within the pelvis. Hydrosalpinx and adhesions on the right side. Uterus displaced toward the right by the sac; U is the fundus uteri; R, the rectum; T, the right closed tube; F, the fetus; and S, the ruptured extrauterine sac.

the most common variety, there is a development of the ovum at some point within the lumen of the tube; in the great majority of instances it is located at about the junction of the middle and outer thirds of the oviduct. Here it begins to develop, as in a normal gestation, but soon encounters resistance from the limited space in which it is confined. The tube dilates to accommodate the growing ovum, and there occurs simultaneously an hypertrophy of its walls from an increase in the size of the individual mus-

cular fibers. This causes the organ to assume a characteristic spindle shape. The hypertrophy, however, is not symmetric at all portions of the tube-walls, and, indeed, there may be at certain points a thinning, rather, of the tissue; it is at one of these attenuated points, usually upon the upper or posterior surface of the tube, that rupture sooner or later occurs. Immediately around the ovum are formed the amnion and chorion, the latter containing the villi as usual. The thickened walls of the dilated tube constitute the so-called decidua, although no true decidual tissue is formed around the fetus. This tubal decidua is an hyperplasia of the tubal mucosa, together with some proliferation of the fibrous and muscular tissue below it into which the thickened mucosa dips; it assumes the functions of a placenta to a limited extent, although generally no true placenta is found. *Direction of Growth.*—The development of the ovum may take place in one of two directions: (1) Most commonly it grows upward into the abdominal cavity. Usually this results in an early rupture of the gestation-sac; more rarely this may not occur, and the growth upward may continue until late in pregnancy, forming a pedunculated tumor attached to the uterus and broad ligament below and extending upward into the abdominal cavity, where it may be detected on palpation, while the uterus is found to be displaced laterally or even retroverted. This is termed the *intraperitoneal* form of tubal pregnancy. (2) More rarely its growth is downward, separating the folds of the broad ligament. This is the so-called *intraligamentous* or *subperitoneopelvic* variety of extrauterine pregnancy. Rupture may occur early in this form, but, owing to the additional support afforded by the substance of the broad ligament, it is possible for gestation to be carried to term. The growth in this case does not reach upward into the abdominal cavity, but fills the pelvic space and lies in close proximity to the uterus, which is generally displaced upward and forward. In exceptional instances the downward

growth between the layers of the broad ligament may be continued until the pelvic floor is reached; the mass is then directed backward and upward, lifting as it advances the posterior deflection of the peritoneum, behind which it continues to develop until it attains its full size at term. This has been termed the *extraperitoneal* or *subperitoneoabdominal* variety of extrauterine pregnancy (Hart and Carter). In all of these varieties extensive adhesions to the peritoneum and adjacent viscera are formed, resulting frequently in serious complications, such as intestinal strangulation, rupture and dislocation of the bladder, or perforation of a bowel, the patient dying of shock, hemorrhage, or septic infection.

(2) *Interstitial Pregnancy.*—That variety of extrauterine pregnancy in which the ovum develops in the portion of the oviduct that passes through the uterine wall is termed an *interstitial* or *intramural* pregnancy. Here much latitude of growth is prevented by the greater resistance of the tissues that form the walls of the gestation-sac. As the ovum develops, a tumor-like projection appears upon the upper and lateral wall of the uterus, and this projection at first consists largely in an hypertrophy of the muscular tissue of the uterus, with the broad ligament and Fallopian tube covering its outer surface. The growth of the ovum, however, soon becomes so excessive that the uterine muscle fails to contain it, and early rupture into the peritoneal cavity ends the gestation. If the direction of growth be toward the uterine cavity, rupture may take place at this point, and the contents be expelled through the normal channel with all the symptoms of an ordinary abortion. In such instances the patient generally recovers without any disastrous sequelæ. This exceedingly rare occurrence may be termed an *interstitial* or *intramural abortion.*

(3) *Tuboovarian Pregnancy.*—A tuboovarian pregnancy (Fig. 98) is that form of extrauterine pregnancy in which the ovum is attached to both the oviduct and the ovary in the space between the tubal fimbriæ. The usual fetal mem-

branes are developed in this variety, but the outer wall of the gestation-sac is formed in part by the tube and in part by the ovary. Owing to the insecure position of the ovum and the lack of sufficient tissue in the wall of the sac, early rupture is the usual termination. Occasionally the growth

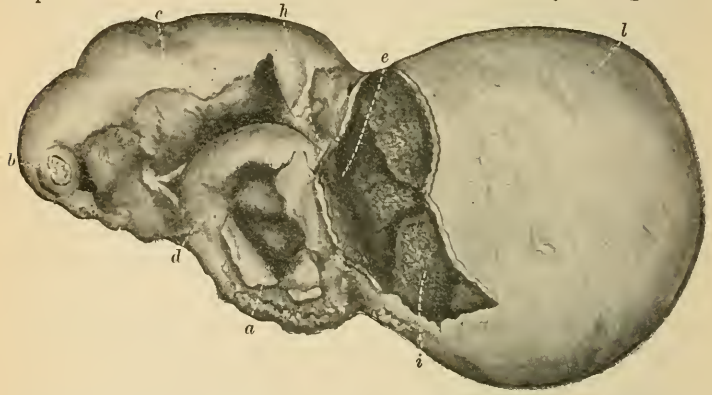

FIG. 98.—Tuboovarian pregnancy: *a*, ruptured Graafian follicle; *b*, uterine end of tube; *c*, Fallopian tube; *d*, ovary; *e*, fetal sac opened; *h*, wall of sac formed by ovary; *i*, placental tissue; *l*, gestation-sac.

may be directed downward, as in the intraligamentous form, and the ovum may then develop within the meshes of the broad ligament, the pregnancy even advancing to term.

(4) *Ovarian Pregnancy.*—An ovarian pregnancy (*internal ovarian pregnancy*), so called, is that extremely rare variety of extrauterine pregnancy in which the fecundation and growth of the ovum take place within the ovisac itself. Just how this occurs is not definitely known, but its occasional existence may be said to have been absolutely demonstrated (Patenko, Paltauf, Hirst, Kiwisch, Puech, Hecker, Coste). Whether it result from penetration by the spermatozoid of an unruptured ovisac or whether impregnation take place in a ruptured ovisac without escape of the ovum, the sac closing after fecundation of the latter, is a matter of speculation only. Impregnated in whatever manner, the ovum commences to develop, and

may even reach full maturity, as in an undoubted instance recorded in the *Transactions of the Philadelphia Obstetrical Society*. More probable is termination by early rupture accompanied by dangerous hemorrhage, or death of the embryo followed by its absorption—if this take place before the third month—and conversion of the gestation-sac into a cystic tumor; in case of fetal death subsequent to the third month the cyst may contain fetal portions. The fetal membranes are well marked in this variety of extrauterine gestation, but the decidua, if such it may be called, is but poorly formed, although affording a certain amount of nutrition and protection to the ovum.

(5) *Abdominal Pregnancy.*—By *primary abdominal pregnancy* is meant that exceedingly rare form of extrauterine fetation in which the ovum, having escaped from the ovisac, becomes impregnated in the peritoneal cavity, probably while still in contact with the ovary (*external ovarian pregnancy*), and, not finding a place for suitable attachment, drops to the floor of the abdominal cavity, where it becomes fixed in either one or the other iliac fossa, in Douglas's pouch, or higher up among the intestines, and there continues its process of development. The fetal structures under these circumstances are well formed, including the placenta, which is attached to the peritoneum covering the pelvic walls, the intestines, or other viscera, and the pregnancy may go to term without interruption. The peritoneum underlying the ovum becomes hyperplastic and intensely congested. The inflammatory action induced gives rise to an exudate that surrounds the ovum, and thus forms a more or less complete cyst-wall containing newly-formed blood-vessels; this structure assumes the function of the decidua. The uterus becomes slightly enlarged from the formation of a true decidua, and the pregnancy may continue to term without interruption. By *secondary abdominal pregnancy* (*metacyesis*) is meant the more frequently encountered con-

dition in which, after the escape of the ovum into the abdominal cavity from a ruptured tubal (*tuboabdominal*) or interstitial or true intrauterine (*uteroabdominal*) pregnancy, the embryo lodges somewhere among the abdominal contents and continues its growth and development. In these cases the fetal membranes encircle the displaced ovum, while the placenta may or may not still be retained at the original site of ovular implantation (in the tube, uterine wall, or uterine cavity), communication between the two being maintained through the agency of the umbilical cord. In those cases in which the pregnancy originally was intrauterine the rupture is probably dependent upon and occurs at the site of some previous solution of continuity in the uterine wall, as from a former Cesarean section or rupture. Usually death of the embryo speedily follows the rupture, but in rare instances life may be preserved and the pregnancy continue to term. In case death occur at a subsequent period, but prior to full maturity, the liquor amnii will become absorbed and the fetus be left *in situ;* the latter may then pass through a series of retrograde changes. In those rare cases in which an abdominal pregnancy advances to term, fetal death usually occurs at the time of the labor, probably as a result of placental detachment induced by the labor-pains.

Symptoms of Extrauterine Pregnancy.—It is mainly owing to the peculiarly vague character of the symptoms of this disease that it remained for so long a time shrouded in mystery even to the most experienced obstetricians. The clinical manifestations may be grouped under those that are common to all forms of extrauterine gestation and those few symptoms that may result from the peculiar location of the respective varieties. *Symptoms of all Varieties in Common.*—In all cases of gestation occurring without the uterine cavity there are developed the same reflex manifestations that are present in normal pregnancy. These generally appear, however, subsequent to a protracted period of

sterility which has often been attended by one or more of the symptoms of an endometritis. The reflex nausea and vomiting of pregnancy are, as a rule, very pronounced, and begin quite early after conception. There is noted generally an arrest of menstruation, at least for one or two periods, possibly with the exception of a primary abdominal pregnancy, in which case menstruation may not be disturbed at all and may even continue regular to the full expiration of pregnancy. This is not absolutely true, for the only disturbance in the menstrual function may be a decrease in the amount of the discharge or the occurrence of an irregularity in the time of the flow; in other instances there may be no cessation at all, but, on the contrary, a constant escape of a serosanguinolent discharge which, just before rupture takes place, may contain small shreds of exfoliated decidual tissue that upon microscopic examination will be found to contain no chorionic villi. Usually the return of the menstrual discharge indicates embryonic death and predicates early rupture of the sac. The mammary changes are the same, as are also the nervous manifestations. There is the same frequency of micturition, or there may be noted an actual dysuria. Vaginal pulsation is generally present. Very often the patient is unable to lie upon the affected side. There is the usual constipation of pregnancy, increasing in intensity as the gestation advances, and there is often an annoying rectal tenesmus, arising from the pressure exerted upon the bowel by the adventitious gestation-sac, the patients often complaining bitterly of it. As the case progresses pressure-symptoms are especially prone to develop upon the side on which the abnormal gestation is located, and at a much earlier period than in normal pregnancy; these include edema of the limb of the affected side, together with lancinating, cramp-like pains originating in the vicinity of the gestation-sac and radiating down the limb and to the sacral region. This prominence of pain should be especially

noted as one of the most decided symptoms of an extrauterine gestation. There may be in association with it an elevation of temperature: this may often be noted as early as the fourth week, and is usually slight—99° or 99.5° F.; at times it may rise to a considerable height, even reaching 105° F., but only in hyperesthetic individuals: with this there may be some impairment of the general health—anorexia, malaise, or more or less nervous exhaustion. At the time of rupture there is very often an acute elevation of temperature. In connection with a history of symptoms like the foregoing, which are presented in common by all the varieties of ectopic gestation, a physical examination of the patient must be made, and it is here that slight shades of difference may be detected between the various forms of the disease.

Physical Signs.—Alterations in the Genitalia.—The changes that take place in the uterus and vagina are the same for all the varieties, and are about identical with those that occur in an ordinary intrauterine pregnancy. The vaginal walls are hyperemic, relaxed, edematous, hypertrophied, and pigmented (*Jacquemin's sign*); there is more or less of a leukorrheal discharge; the cervix uteri is soft, and the external os may be somewhat patulous, although the mucous plug that is usually present in pregnancy fills the cervical canal; the uterus is enlarged, but not to an extent proportionate to the duration of the pregnancy, and, instead of being strongly anteflexed, as in a normal pregnancy, it is more often laterally disposed, being carried to the side of the pelvis opposite to that in which the ectopic gestation is developing. The uterine enlargement is due to the formation within the organ of a decidua which is almost identical in histologic structure with that developed in a normal gestation. In very rare cases, however, the uterus may be scarcely altered in size and no decidual membrane be formed. If the condition be one of *tubal* gestation, there will be detected on the affected side, on a line with

or behind the uterus, or more rarely anterior to that organ—which will be displaced accordingly—a very sensitive rounded tumor, it may be about the size of a small orange, fixed in its position and giving a peculiar elastic or semi-fluctuating sensation as well as a distinct and often well-marked pulsation; in many cases ballottement may be detected at an early date. The only distinguishing point of *interstitial* pregnancy is an increased size of the uterus—that is, to a greater extent than in simple tubal pregnancy—with a less marked line of demarcation between the uterus and the gestation-sac. There are no distinctions to be drawn between the physical signs elicited in an *ovarian* and a tubal pregnancy: abdominal section alone will reveal the true state of affairs. In case of *abdominal* pregnancy the uterus will be but slightly enlarged above the normal; the cervix will show the peculiar softness of pregnancy; a large tumor will be found at some point in immediate proximity to the uterus, varying in shape, often having its long axis in a transverse direction, and not corresponding to the rounded or oval tumor of a normal pregnancy; in advanced cases the fetal parts may be very readily palpated through the abdominal walls, or through Douglas's cul-de-sac should the ovum be behind the uterus, while the heart-sounds will be heard with unusual distinctness.

Diagnosis of Extrauterine Pregnancy.—It is patent that the making of a positive diagnosis prior to the occurrence of rupture of the gestation-sac, although quite possible in view of the advanced knowledge of the disease, must always be a matter of considerable difficulty. That some pathologic condition exists is a self-evident fact, but in many instances the correct state of affairs can be recognized only after the exploratory incision has been made. There are several factors which when taken in conjunction render it possible to make a fairly strong presumptive diagnosis of the obstetric condition, and these are the history of the signs of an early pregnancy accompanied by a rapid development

of the reflex symptoms in an aggravated form; the early appearance of abdominal pain, exceedingly sharp and cramp-like and steadily increasing in severity; the presence of a sensitive tumor to one or the other side of the uterus; and the non-development of the uterus as in a normal pregnancy. In no instance is it justifiable to resort to the use of the uterine sound to solve the question. The occurrence of rupture will greatly facilitate the diagnosis, and in those rare cases in which pregnancy is well advanced or even reaches term no difficulty should be experienced in arriving at a positive conclusion. It is only in the early weeks that the diagnosis is shrouded in uncertainty, but, unfortunately, this is the period in which it is most important for a positive knowledge of the condition to be entertained in order that a fatal termination from rupture may be avoided. There are certain pathologic states that closely simulate ectopic pregnancy, the most important of which are cornual pregnancy, pyosalpinx associated with an uncertain history of gestation, normal pregnancy complicated with the development of a fibroid tumor in one of the lateral walls of the uterus, and extreme lateral flexion of a pregnant uterus. Some of the points to be borne in mind in studying cases representing the respective conditions are presented in the following tables, which are not to be accepted as conclusively determining the diagnosis in any given case, but are to be looked for as probable points of difference that, in combination with the history of the case, will assist in arriving at a presumptive diagnosis:

From *cornual pregnancy:*

Extrauterine Pregnancy.	*Cornual Pregnancy.*
Rupture is most prone to take place at some period during the first three months.	Rupture usually occurs between the third and sixth months.
The tumor exists to one or the other side of the uterus, and is usually distinct.	There may be but one tumor, this being dependent upon the degree of bifurcation.
The tumor is exceedingly sensitive and semi-elastic.	The tumor is not so sensitive, and presents the characteristics of a uterine tumor.
The round ligament may be felt attached to the uterus on the inner or uterine side of the gestation-sac.	The round ligament is displaced outward and is attached to the external side of the gestation-sac.

Extrauterine Pregnancy.

Examination of the removed specimen shows an absence of true decidual tissue.

In interstitial pregnancy the gestation-sac communicates with the uterine cavity by the orifice of the Fallopian tube.

Cornual Pregnancy.

True decidual tissue will be found surrounding the fetal membranes.

The two halves of the uterus are united by a muscular band.

From *pyosalpinx:*

Extrauterine Pregnancy.

The uterus is enlarged, with a soft cervix and the peculiar softening of the body that is present in pregnancy.

There is a history of sterility, with the signs of endometritis or salpingitis.

The tumor is small, exceedingly sensitive, but, as a rule, not firmly bound down in the pelvic cavity.

Rupture is likely to occur at some time during the first three months.

The usual clinical manifestations of pregnancy will be present.

Pyosalpinx with Indistinct History of Pregnancy.

The uterus is probably not enlarged, the cervix is not soft, and there is not the elastic feel that is present in pregnancy.

There is a history of acute attacks of peritonitis occurring at intervals after an attack of gonorrhea.

The tumor is large, moderately sensitive, firmly bound down in the pelvis, and surrounded by a mass of exuded lymph.

The history may have covered a period of months without the symptoms of rupture.

The clinical manifestations of pregnancy are absent or very indistinct.

From *intrauterine pregnancy with fibroid tumor:*

Extrauterine Pregnancy (*Tubal Variety*).

There is discovered to one side of the uterus a mass, rounded, exceedingly sensitive, and elastic or semi-fluctuating.

The uterus is enlarged, but not to a size proportionate to the period of gestation.

The menstrual history is irregular, and there may be an early return of the show.

Rupture occurs at the usual time.

Pain is an early and prominent symptom.

Intrauterine Pregnancy complicated with Fibroid Tumor.

The mass may be rounded; more often it is nodulated, very hard, non-elastic, and non-fluctuating, and not sensitive to the touch.

The size of the uterus corresponds to, or is even in excess of, the time of gestation.

Menstruation is likely to be suppressed.

No signs of rupture follow.

Pain develops only after the tumor has reached sufficient size to press upon the surrounding structures.

From *lateral flexion of a pregnant uterus:*

Extrauterine Pregnancy.

The body and cervix of the enlarged uterus are generally in a straight vertical line.

The extrauterine gestation-sac is in close proximity to the body of the uterus.

Anesthetization reveals the mass closely attached to the fundus and readily outlined.

The size of the uterus is much below that indicated by the duration of the pregnancy.

The menstrual history is irregular.

There is a history of severe abdominal pain and rectal tenesmus.

Intrauterine Pregnancy with Lateral Flexion of the Uterus.

The fundus lies to one side of the pelvis, with the cervix carried to the opposite side.

A deep sulcus may be felt between the fundus and the cervix.

Anesthetization reveals a normal condition of the appendage.

The size of the uterus corresponds to the period of the gestation.

Menstruation is suppressed.

Usually there is no pain other than a backache; there is no rectal tenesmus.

Prognosis.—Of the many obstetric complications to which woman is heir, extrauterine pregnancy must be classed as one of the most serious. It is universally recognized that hemorrhage is the great danger to be feared. Not only is this likely to occur from rupture of one of the enlarged vessels in the Fallopian tube and broad ligament, but there is reason to believe that a peculiar hemorrhagic tendency exists in this condition whereby serious or even fatal bleeding may occur from vessels or structures more or less remote from the gestation-sac. Thus, Drs. J. L. Mitchell and W. C. Goodell recently reported a case of fatal hemorrhage occurring from one of the splenic veins without appreciable cause. This is a possible contingency that would add materially to the gravity of the prognosis. If left to nature, the mortality of extrauterine pregnancy is about 66⅔ per cent., the remaining 33⅓ per cent. recovering by the so-called spontaneous cure brought about by death of the ovum with absorption of the contents of the gestation-sac. If an appropriate course of treatment be instituted, either before or immediately after rupture has occurred, the mortality may be reduced to less than 5 per cent. As to the ultimate effect upon the woman's general health, the prognosis is also doubtful. Those who survive the immediate consequences of the disease often linger through protracted periods of invalidism consequent upon the shock and excessive hemorrhage coincident with rupture of the gestation-sac. In other instances troublesome and dangerous, or even fatal, sequelæ are recorded, such as ulceration with pelvic or abdominal abscess-formation in cases of retained products of conception; ulceration and perforation of the intestines, bladder, or abdominal walls consequent upon pressure exerted by retained fetal parts; or intestinal obstruction from ultimate contraction of inflammatory bands of lymph formed during the gestation.

The *methods* by which nature unaided terminates an

ectopic pregnancy are but three. Taken in the order of their frequency, they may be stated as follows:

(1) *Rupture* with hemorrhage and frequently death. This occurs in tubal pregnancy when the tube has been stretched to its fullest extent, and takes place generally during the third month of gestation, although it has been noted as early as the fourth week and as late as the sixth month. The usual *site of rupture* in tubal pregnancy is in the upper and posterior portion of the tube, and the hemorrhage then takes place directly into the abdominal cavity; hence it is unlimited. In rarer instances the rupture will occur in the lower portion of the tube, and the blood, to a much smaller amount, will then be poured into the meshes of the broad ligament. In the ovarian and abdominal varieties the rupture, when it occurs, takes place directly into the abdominal cavity, while in interstitial pregnancy it may occur either into the abdominal cavity, into the layers of the broad ligament, or very rarely into the uterine cavity. The *amount of blood effused* is very generally excessive, but is quite independent of the size of the gestation-sac or the period to which the pregnancy has advanced; considerable blood may be lost by the rupture of a small sac, and *vice versâ*. At times, especially when there have been repeated hemorrhages, so considerable may have been the loss that the woman will be almost completely exsanguinated, and the incision made through the abdominal wall at the time of operation may be absolutely bloodless, the tissues cutting like so much compact suet. At other times the hemorrhage may be controlled by bands of adhesion, clots, fetal portions, or the layers of the broad ligament. It is possible in excessive hemorrhage to detect the soft, boggy masses through the posterior vaginal fornix or even on palpation of the abdominal walls. Upon the amount of blood exuded will depend the length of time that a woman may survive the rupture of the sac; in the average case death will supervene in

from eight to twenty hours, although it has followed in two hours, or has been postponed for days or even weeks. As to the *determining cause of rupture* very little that is positive can be said. The sac-walls yield when they have reached their utmost degree of distention, and it will at this time need but a trivial exciting cause to determine the rupture. In the majority of instances this is so obscure as to altogether escape the notice of the patient. Often rupture has occurred while she was at rest in bed or while sitting in her chair; it has followed straining at stool, some sudden shock, mental emotion, or physical strain, sexual intercourse, a hasty and it may be rough manipulation during a gynecologic examination, or some minor operative procedure upon the genitalia, as a rapid dilatation or a uterine curetment. The attendant *symptoms* are sudden and very characteristic. There may have been noticed for a few days preceding a gradually increasing sanguinolent discharge from the vagina containing granular débris or shreds of dark decidual tissue which probably indicate death of the embryo. Exceedingly severe cramp-like pains in the iliac region of the affected side, at times sufficient to cause the woman to drop to the floor in collapse, attend the rupture of the sac-wall; they are accompanied by all the symptoms of concealed hemorrhage—extreme pallor of the surface, feeble running pulse, the so-called "*air-hunger*" (audible yawning), moist, clammy skin, coldness of the extremities, profound shock, vomiting, and at times coma with perhaps varying degrees of abdominal distention; the vaginal discharge increases, and now may contain large masses of decidual tissue or even complete casts of the uterine cavity, the decidua coming away *en masse*. If the amount of hemorrhage be considerable and death do not promptly supervene, the woman will, if unattended, shortly present the symptoms of a rapidly developing peritonitis.

The *varieties of tubal rupture* that have been noted, as

well as the ultimate results, may be grouped into two main classes—namely, (1) *external rupture*, including those in which there is complete rupture of the tubal walls as well as of the walls of the gestation-sac; and (2) *internal rupture*, including those in which there is apparently rupture of the walls of the gestation-sac only without coincident rupture of the tubal walls. Under the first heading, *external rupture*, may be mentioned the following distinct subdivisions, enumerated in about the order of the frequency of their occurrence: (*a*) *Rupture of the sac-wall, with profuse hemorrhage into the abdominal cavity, and death.* This is by far the most common form, and may occur in any of the varieties of extrauterine gestation; the hemorrhage is unlimited. (*b*) *Rupture of the sac-wall, with limited effusion of blood into circumscribed spaces between bands of inflammatory lymph, producing the so-called pelvic or abdominal hematoceles.* For many years these limited effusions of blood were unrecognized as having any relationship to a preceding ectopic gestation, and it has only been within the past decade or two that this truth has been positively demonstrated. The most common situation in which the hematocele is found is Douglas's cul-de-sac, where it constitutes the so-called *retrouterine hematocele;* if, as rarely occurs, the blood accumulate in the vesicouterine pouch, the condition is termed an *anteuterine hematocele.* Other hemorrhagic accumulations have been noted in the immediate vicinity of the broad ligaments or wherever inflammatory adhesions may have formed between the pelvic or abdominal viscera. (*c*) *Rupture of the sac-wall, with effusion of blood into the meshes of the broad ligament.* This constitutes what has been termed *hematoma of the broad ligament.* The hemorrhage in this case is necessarily limited—that is, as long as the distended tissues of the broad ligament maintain their integrity. In many cases the pressure from the accumulated blood is so great that the thin layer of peritoneum yields, and the confined fluid finds vent into the abdom-

inal cavity (secondary abdominal hemorrhage); a fatal result often follows this accident. In the second group, *internal rupture*, are likewise found a number of subdivisions that are also presented in about the order of their frequency. These are as follows: (*a*) *Rupture of a large vessel in the sac-wall, with profuse hemorrhage into the gestation-sac itself, and death of the embryo.* This condition is described by some writers under the term *hematoma of the sac.* Such an accident need not necessarily result fatally to the woman, but always results in the death of the product of conception. Usually it occurs early in the gestation, and is, as a rule, followed by absorption of the ovum. (*b*) *Rupture of the outer or pelvic wall of the gestation-sac without coincident rupture of the tubal wall, with profuse discharge of blood into the abdominal cavity through the fimbriated extremity of the tube.* This rather rare termination of tubal pregnancy has been very appropriately termed by Bland Sutton *tubal abortion.* The hemorrhage may be excessive, and may be repeated at varying intervals of time until the excision of the tube. (*c*) *Rupture of a large vessel, with effusion of blood into the sac-walls themselves, without penetration into the abdominal cavity or into the meshes of the broad ligament.* This condition is known as *hematoma of the tube*, and is not, as a rule, accompanied by a profuse loss of blood. The ovum dies and undergoes a process of atrophy and partial absorption. (*d*) *Rupture of the inner or uterine sac-wall, with discharge of the contents of the gestation-sac into the uterine cavity, whence they are expelled as in an ordinary abortion.* This, the opposite of tubal abortion, which may be termed *interstitial* or *intramural abortion* (since it is possible for it to occur only in cases of the so-called interstitial pregnancy), is an exceedingly rare termination of tubal gestation, and is even claimed by many writers never to occur.

(2) *Death of the Product of Conception.*—This event will be followed by varying results according to the time at

which embryonic death occurs. If this happen prior to the third month of gestation, there follows complete cessation of the signs of pregnancy, with subsidence of any and all the symptoms of the abnormal condition that may have been present. The ovum undergoes a process of absorption, and it and the gestation-sac may be entirely removed, so that no trace of either as, such, can be found. There remains, however, a chronically diseased and distorted condition of the tube. This termination constitutes the so-called spontaneous cure of tubal gestation that is thought to occur in about one-third of the cases of this interesting condition. Should embryonic death occur subsequent to the third month of gestation, as is the case usually in ovarian or abdominal pregnancy, such a termination as the preceding could not be expected. Under these circumstances there will follow an absorption of the liquor amnii with partial atrophy of the gestation-sac, while various changes, as maceration, calcification, mummification, adipoceration, or putrefaction, may take place in the fetus itself. The entire gestation-sac may be converted into an *abscess-cavity*, which may rupture into the peritoneal cavity, the bowel, the bladder, or through the abdominal wall, subjecting the woman to all the risks of septic peritonitis, septicemia, and exhaustion from fecal and other fistulæ.

(3) *Continuance of the Pregnancy to Term.*—This, when it occurs, usually takes place in an abdominal or ovarian pregnancy, although it is quite possible for a tubal pregnancy to be carried to term, the walls of the tube undergoing an enormous dilatation. Necessarily, this is an exceedingly rare termination of ectopic gestation. In these cases the woman falls into labor at the normal time, but owing to the abnormal circumstances the pains are ineffectual, gradually pass away, and a variety of missed labor results, the fetus generally perishing from placental separation.

As a résumé of the foregoing these terminations of extrauterine pregnancy may be tabulated as follows :

I. Rupture.
   1. *External:*
      (1) Into the free abdominal cavity.
      (2) Into the abdominal cavity between bands of adhesions (*pelvic* or *abdominal hematocele*).
      (3) Hematoma of the broad ligament.
   2. *Internal:*
      (1) Hematoma of the sac.
      (2) Tubal abortion.
      (3) Hematoma of the tube.
      (4) Interstitial or intramural abortion.

II. Death of the product of conception.
      (1) Before the third month (*spontaneous cure*).
      (2) After the third month.

III. Continuance of the pregnancy to term.

Treatment.—There is no more important matter than the proper management of an extrauterine pregnancy. This may conveniently be disposed of under the two captions of early and advanced gestation. (1) *Early Gestation.*—Any attempt to palliate in a condition of such gravity as that under consideration should not be countenanced. As soon as a suspicion of the existence of an ectopic pregnancy is entertained energetic measures must be taken to confirm, if possible, or to disprove, the diagnosis. If an absolute decision cannot be reached and the patient can be kept under constant surveillance, the physician may be justified in waiting until the symptoms of rupture indicate active interference: it may be that the fortunate termination by spontaneous cure may ensue, and the patient thus escape the dangers of rupture or of an exploratory abdominal incision. Under no circumstances should attempts to destroy the life of the product of conception be made. The use of the electric current, either faradic or galvanic, and Joulin's method of injections of strychnin or morphin into the sac, have in repeated instances signally failed to accomplish the object in view, and when successfully employed the

patient has been exposed to the imminent danger of peritonitis or of septicemia consequent upon putrefaction or suppurative changes in the deceased embryo. In those cases in which the medical attendant feels justified in making an absolute diagnosis, or whenever symptoms of rupture have supervened, but one course of treatment is indicated—namely, immediate abdominal section with removal of the gestation-sac. Efforts to determine whether or not the effusion of blood is circumscribed are futile, and valuable lives may be lost by the delay thus imposed. The steps of the operation are—(*a*) The observance of absolute antisepsis; (*b*) a median abdominal incision; (*c*) the evacuation of clots and free blood that will be contained within the abdominal and pelvic cavities subsequent to rupture; (*d*) the separation of any adhesions that may exist; (*e*) the ligation and extirpation of the affected tube; (*f*) irrigation of the peritoneal cavity with hot water; (*g*) closure of the abdominal incision; the subsequent treatment the same as in an uncomplicated ovariotomy.

(2) *Advanced Gestation.*—After passing through a period of controversy that was ably carried on by the advocates of the radical methods of treatment, and those of the conservative measures that were employed in the hope of saving the fetal life when this was clearly demonstrated to exist, the method of immediate removal of the gestation-sac subsequent to the making of the diagnosis is now coming into very general favor as affording to the patient the best chances of recovery. The steps of the operation under these circumstances are essentially the same as in the earlier operation, modified, however, by the greater frequency of complications dependent upon the presence of extensive inflammatory adhesions. When possible, complete extirpation of the sac should be made, and if this can be accomplished the subsequent treatment is the same as that for an ordinary abdominal section. If, however, it be found necessary to leave behind a portion of the sac or the placenta—

and in these advanced cases attempts at removal of the placenta will almost invariably result fatally—after ligation and removal of as much as can be secured the edges of the retained portion should be stitched to the margins of the abdominal incision, the sac thoroughly irrigated, and a packing of iodoform-gauze introduced. This is necessarily followed by a prolonged convalescence while the retained portions are undergoing the process of disintegration and discharge, and necessitates on the part of the medical attendant the adoption of stringent measures to prevent the development of septic processes during this period.

(4) **Cornual Pregnancy.**—Cornual pregnancy, or pregnancy taking place in one of the rudimentary horns of a bicornate uterus, is of exceedingly rare occurrence. Clinically, it so closely simulates tubogestation that it is almost impossible to draw any line of distinction between the two. The main diagnostic point lies in the relation existing between the gestation-sac and the round ligament. In cornual pregnancy the latter may be traced from the pelvic brim to the outer aspect of the gestation-sac, while in tubal pregnancy it holds a position to the inner side of the sac. In addition to this, at the time of rupture of a cornual pregnancy true decidual tissue will be found in intimate connection with the fetal structures. The course of the two conditions is the same, with the exception that the uterine tissues will permit of greater distention than will the tubal walls; hence rupture will occur at a more advanced period of gestation, usually between the third and sixth months. The *site of the rupture* is generally the upper border of the cornu; the hemorrhage may be excessive and prove rapidly fatal. Other possible terminations are rupture into the uterine canal with expulsion of the product of conception, as in ordinary abortion, or, more rarely, development of the fetus to term, the condition ending in a natural labor. The *treatment* consists in abdominal section, with excision of the entire uterus according to the Porro method.

(5) **Missed Labor.**—This is a rare occurrence, in which at the time of full maturity of the fetus the woman falls into labor, experiences a few ineffectual labor-pains that gradually pass away without the appearance of the remaining signs of labor, and the product of conception is retained *in utero* for an indefinite period covering months or even years. In rarer instances there is merely a prolongation of pregnancy without the occurrence of any pains whatever. *Causes.*—The etiology of this accident is obscure. It generally results from some form of obstruction, as a fibroid tumor of the uterus, an ovarian cystoma, an exostosis or sarcoma of one of the pelvic bones, a sarcoma of the uterus, cervical carcinoma, or cicatricial bands of adhesions in the cervix or vagina. In other cases it may be an extrauterine pregnancy that has advanced to term, or there may be an abnormal absence of uterine irritability, so that the patient will not fall into labor. *Results.*—Invariably the fetus dies and undergoes some process of katabolism. Usually the soft tissues become macerated and are discharged in portions, while the bones are retained to undergo disintegration at a later period, with ultimate discharge through the cervix; if this be impossible, they may ulcerate their way through the uterus into the vagina, rectum, or abdominal cavity, with escape through the anterior abdominal wall in the latter instance. Septic metritis, septic peritonitis, or septicemia may result during this process, and the patient lose her life in consequence. Other possible changes are mummification, calcification, adipoceration, and putrefaction. *Treatment.*—If the patient be known to have gone at least two weeks beyond the normal period of pregnancy, labor should be induced at once, otherwise the excessive growth of the fetus may give rise to complications at the time of delivery. In the rare cases in which weeks or months have elapsed and fetal death has followed, with maceration or putrefaction, the cavity of the uterus must be emptied manually with every antiseptic precaution, the patient being

anesthetized. When a septic metritis has developed, or in case of ulceration with perforation of the uterine wall, an abdominal section is indicated, with removal of the fetal portions, and, if need be, a hysterectomy may be done to prevent the development of a general septicemia.

II. PATHOLOGIC CONDITIONS OF THE FETUS.

During its process of evolution *in utero* the embryo and fetus leads a precarious existence. Not only is it exposed to the dangers of the development of inherent defects and pathologic states the result of congenital infection derived from either the male or the female pronucleus, but morbific processes in its autosite, the mother, may very readily react disastrously upon the sensitive and growing organism within her womb. Thus, from the very moment of inception to the hour of parturition not a day passes in which some new peril does not menace embryonic and fetal life. Some misplacement of embryonic tissue, some profound mental impression made upon the mother during her pregnancy, the occult influence of the imperfectly comprehended laws of telegony, or some inflammatory processes occurring in the fetal investments,—any or all of these may so alter or divert the normal process of development and maturation as to lead to the production of a fetal teratism; the implantation within the ovular structures of a profound dyscrasia may engender such perverted tissue-metabolism as to result in the formation of a puny and imperfectly elaborated organism at term, or even destroy the vitality of the product of conception before the period of maturity; and, finally, through the invasion of the maternal system by pathogenic germs of extreme virulence the fetus itself may become infected, and, in miniature, pass through the various stadia of the disease. The study of fetal pathology, therefore, becomes no trivial matter. Unfortunately, because of its esoteric processes, as

yet but comparatively little is known of it. Owing to the unflagging efforts of such men as Graetzer, and more recently Ballantyne of Edinburgh, its mysteries are now becoming somewhat better understood, and it is beginning to assume its proper importance in the science of obstetrics. Again pursuing a rational plan of treatment, attention will first be directed to that interesting department of fetal pathology known as *teratology*, or the science pertaining to malformations and monstrosities, and then to the various diseases and accidents to which the fetus may be liable.

1. Fetal Malformations and Monstrosities.

The variations in the fetal form and structure consequent upon abnormal conditions during the process of development are numerous and interesting, and form, when exaggerated, some of the most important elements in the production of fetal dystocia hereafter to be considered. The exact *etiology* of these monstrosities is unknown. It is probable, however, that in many instances maternal psychic impressions—anxiety, grief, fear—play a prominent causative rôle. Also, any cause tending to produce a partial detachment of the fecundated ovule from the decidua, such as deciduitis or attempts at abortion, may be operative in producing fetal teratosis. Syphilis has been suggested as a cause, and hydramnios is at least a frequent concomitant. The classification of these abnormalities as made by Geoffroy Saint-Hilaire had long been adopted by the medical profession as the standard treatise on the subject, and this is essentially true to-day, although through the labors of Professors Hirst and Piersol his grouping has been somewhat modified and perfected in the lines of progress that have followed more thorough information on the subject. According to this revised classification, fetal abnormalities are grouped into three main classes as follows:

(1) **Hemiterata**, a class of malformations including all fetal bodies presenting any abnormality of development not

grave enough to be called monstrous nor of the specific character to be classed as heterotaxic or hermaphroditic. In this class are included all those numerous abnormalities of volume, form, color, structure, and number which, while striking enough to form distinct variations from the normal, do not in any way gravely modify the existence of the creature or interfere with the functions of life. Here are to be placed the changes in stature, including delayed growth with general diminution in size, as in dwarfs, and excessive development with general increase in size, as in giants. Instead of being general, this variation in development may be localized in some one portion of the body; thus there may be deficient or excessive development of a part, as an atrophy of one limb or an overgrowth of the cranial vault; there may be excessive development of a certain system or element of the body, as when there is a superabundance of fatty tissue; or, on the other hand, there may be imperfect development of a system or an element, as when there is a marked arrest of growth in the muscular tissue of the body; certain organs may be under-sized or over-sized, as in *macromazia* (hypertrophy of the mammæ), or its converse, *micromazia* (abnormal smallness of these glands). In a second group of fetal malformations the anomaly may consist in a misshape of a certain organ or part, as when there is a deformity of the pelvis or when there is a peculiarly formed head, stomach, or other part or viscus. A third group includes those fetuses in which the parts, organs, or systems are perfectly developed, but in which there is a defect in the pigment of the body—either a deficiency or an absence, constituting a partial or complete *albinism*, an excess, resulting in a partial or complete *melanism*, or an abnormal coloration of a certain part, as in a pink tint of the irides. In a fourth group of cases of hemiterata the formation and development may be normal, but the structure of a certain part or system may be radically altered; thus, there may be a lack of ossification in the

osseous system, the bones retaining their fetal cartilaginous condition, or there may be a deposit of the lime-salts in a part normally free from such elements, as when there occurs a more or less complete ossification of the muscular or fibrous tissues of the body. A fifth group includes those fetuses in which there appear either more or less than the usual number of parts or organs: here may be included the instances of supernumerary digits, double or bicornate uterus, double vagina, polymastia, polychiria, an excessive number of teeth, a deficiency in the number of teeth, ribs, vertebræ, and muscles, or absence of an organ or a part.

(2) **Heterotaxis**, a class of fetal malformations including the anomalous disposition or transposition of parts or internal organs without interference with nutrition or function. Here may be grouped the curious cases of splanchnic inversion, as when there is an anomalous position of the heart or stomach, the various forms of visceral hernia, or exstrophy of an organ, as the bladder. In rare cases these inversions may be general, and all the organs of the body be located upon the opposite side of the trunk, or the abdominal viscera occupy the position usually held by the thoracic viscera, and *vice versâ*. The other tissues may join in this displacement, and then are noted anomalies in the position of certain blood-vessels, of the molar teeth, or of other parts or structures. In another group of cases normal parts are developed in abnormal relations, as when teeth appear out of the regular line of the gum-margin, or when a false joint exists, or muscles or ligaments are attached to structures other than in the normal individual; when unusual branches arise from a nervous or arterial trunk; or when abnormal openings exist in the body, as of the rectum or urethra into the vagina. In another group of cases there are anomalous imperforations, as of the rectum, vagina, mouth, or esophagus, while in still another group are classed anomalous perforations, as when there is a persistence of certain fetal structures, such as the foramen

ovale, the urachus, the ductus venosus, or the ductus arteriosus. In this same class may be grouped those instances of anomalous divisions of parts normally united, such as congenital splits and fissures (hare-lip, cleft palate, hypospadias, fissured cheek, fissured tongue, coloboma). Another group embraces all instances of congenital union of organs, such as the horseshoe kidney, webbed fingers or toes, tongue-tie, adhesion of the tongue to the palate, the union of teeth or of the testicles. To this same class of heterotaxis also belongs the interesting condition of hermaphrodism, either true or false.

(3) **Teratism**, or the development of monsters or monstrosities. By a *monster* or *monstrosity* is meant a fetus exhibiting some abnormal development, some superfluity or deficiency of parts, or some vice of conformation. Monsters may be *single* or *composite* according as to whether they are composed of the parts of one or of two or more fetuses, and *autositic* or *omphalositic* (parasitic) according as to whether they are capable of self-existence or derive their being through nourishment taken from another fetus, the autosite. A vast variety of these malformations have been described, and a classification suggested by Saint-Hilaire has been generally adopted, reference to which must be had elsewhere.

2. Fetal Disease.

During the process of development the fetus is subject to numerous diseases that may seriously interfere with its vital functions, and which in many instances succeed in destroying the fetal life at varying stages in its growth. Unfortunately, but little is known of the changes that take place during these pathologic processes, how or when they are acquired, what are their clinical manifestations—if they have any—or what their terminations other than the most constant one, fetal death. Considered systematically, our knowledge of this very imperfectly known subject may be grouped as follows:

1. **General Diseases.**—(*a*) *The Infectious Diseases.*—The fetus *in utero* is prone to develop any of the zymoses or exanthemata upon exposure of the mother to the specific germs of these diseases. As to just how the germs find access to the fetal system nothing definite can be stated; it is probable, however, that the transmission from mother to child is accomplished entirely through the agency of the placental circulation. The fetus shows an unequal aptitude for the acquirement of these diseases, readily yielding, for example, to invasion by the germs of variola, measles, and typhoid fever, while very persistently resisting encroachment by those of tuberculosis and malaria. In the case of *small-pox*, fetal inoculation, while very general, is not always the rule, and the child may even escape altogether while the mother experiences a sharp attack of the disease; in some instances the disease manifests itself in the infant only after birth, although the mother suffered from an attack at some comparatively remote period of the pregnancy. In other cases, while the mother's immunity is complete, the fetus may acquire small-pox and pass through a pronounced attack with ultimate recovery, or more generally the pregnancy be terminated prematurely. The disease usually assumes the discrete form in the fetus. *Measles*, while rarely affecting the fetus, almost invariably results in abortion when it has once invaded the fetal system; the same may be said of *scarlatina*, *typhoid*, *typhus*, and *relapsing fevers*, which, while occasionally encountered, are rare, and usually result in abortion; especially is this true of typhoid and relapsing fevers. Very rarely does *malaria* terminate a pregnancy, although this has been known to occur, and the fetus has shown evidences of the disease in a splenic enlargement and in the presence of the pigment-granules in the blood and tissues. *Asiatic cholera* may attack the fetus and destroy it by asphyxiation, the result of changes in the maternal blood. *Acute lobar pneumonia* frequently causes termination of pregnancy from fetal

death due to hyperpyrexia or asphyxiation from imperfect oxygenation of the maternal blood. Other infectious diseases that have been noted as affecting the fetus *in utero*, though rarely, are anthrax, yellow and recurrent fevers, leprosy, and erysipelas, all generally terminating in abortion.

(*b*) *Congenital Rachitis.*—Fetal rickets is a common condition, and may, in pronounced cases, be a cause of marked fetal dystocia. The disease is not manifested during intrauterine existence, but may very readily be recognized at birth. The signs are to be found in the osseous system only, and are as follows: The characteristic square-cut head with prominence of the frontal and parietal bosses; craniotabes; at times lateral inclination of the head upon the spinal axis; extreme prominence of the articulations of the body; varying degrees of spinal curvature; frequently marked prominence of the sternum, constituting the so-called *pigeon-breast;* the presence of the "beading of the ribs" (*rachitic rosary, rachitic rose-garland*), a succession of visible and palpable nodosities at the points of junction of the ribs and costal cartilages; curving of the long bones of the body, or even the so-called *spontaneous multiple fracture* of these bones, due to their excessive fragility. The *treatment* of this condition, if it be suspected, consists in supplying the mother with a rich and nutritious diet and the administration of the hypophosphites and the salts of lime in suitable amounts.

(*c*) *Fetal or Congenital Syphilis.*—Of all the diseases of the developing embryo, syphilitic infection is the most common and probably the most serious; if it do not result in early abortion, it will very frequently terminate fetal life at a late stage in pregnancy, or in less virulent cases seriously affect fetal health. The infection may take place directly through the mother, or it may be purely paternal in origin, the mother becoming infected from her syphilitic fetus, and manifesting the secondary symptoms of the disease without primary lesion. The woman may infect her offspring in one

of two ways—namely, either at the time of conception, the malady being present in her system prior to that occurrence, and consequently the ovum itself being the seat of the disease before its meeting with the male element; or she may infect the embryo or fetus at any time during pregnancy through the placental circulation. The most common method of fetal infection is through the medium of a syphilitic ovum; the next in frequency is through the agency of a syphilitic spermatozoid; and, finally, though rarely, through late infection of the mother, with transmission of the specific taint through the agency of the placental circulation. In some cases the disease is transmitted in a very virulent form to the embryo by both parents, in which case early abortion is generally the result. The intensity of the fetal manifestations also depends upon the length of time the disease has existed in the parent transmitting it, as well as upon the amount of treatment that has been instituted before conception. *Clinical Manifestations.*—Appreciable symptoms are absent, as a rule, prior to those of abortion. In the infrequent cases in which the fetus becomes infected late in pregnancy the patient may not miscarry, and the only signs that may lead to the suspicion of the transmission of the disease to the product of conception may be a gradual weakening of the fetal heart-sounds and movements, with sudden death of the offspring shortly before the onset of labor. As a rule, however, the development of such fetuses is to all intents undisturbed, and gestation is carried to full term, when there ensues the birth of an apparently healthy child, the specific disease only manifesting itself some weeks or months subsequent to labor. *Ultimate Results.*—In the vast majority of instances of congenital syphilis the fetus is either still-born, prematurely discharged, or the pregnancy is terminated by an early abortion. In the comparatively few cases that arrive at term with symptoms of the disease well advanced, fetal death usually follows within a few weeks. The cause of the prem-

ature discharge of the ovum is a fatty change in the placental tissues consequent upon the syphilitic inflammation of those structures. *Pathology.*—As in syphilis in the adult, the pathologic processes are to be found more or less marked in all the tissues of the body; the changes wrought by the disease are those of a chronic inflammation—namely, cellular infiltration with hyperplasia of the connective tissues wherever found. The placenta will present the characteristic signs already described (see page 235), and the umbilical cord will show degrees of stenosis of the vessels consequent upon the same hyperplasia of the connective-tissue element. The vascular system throughout the body also shares in this process. The fetus is small for the period to which the pregnancy has advanced, is exceedingly emaciated, and the skin is shrivelled and yellowish in color, giving the body a peculiar old and wrinkled aspect. Upon the palms of the hands and soles of the feet are very commonly developed large pemphigoid bullæ, and this is an absolutely positive sign of fetal syphilis, for the lesions of the ordinary nonspecific pemphigus never occur in these regions, although present upon any other portion of the body; at times these bullæ may have ruptured, and then they appear as slightly elevated erosions. The glandular structures of the body are all notably increased in size and weight, especially the spleen and the thymus gland; if the latter organ be cut into and its tissues compressed, it yields a milky, puruloid fluid that is very characteristic. The liver is exceedingly large, and often fills the entire abdominal cavity, displacing upward and downward the other viscera: on section of this organ large patches of hyperplastic connective tissue may be noted surrounding areas of indurated and bile-stained hepatic tissue, the whole being imbedded in normal liver-cells; the same serous fluid exudes when the organ is subjected to pressure. In the lungs may be found varying pathologic features according to the degree to which the specific changes have advanced; usually

there is found a condition of fibroid pneumonia characterized by an induration of the lung not dependent upon an exudation of cells, but upon a hyperplasia of the pulmonary connective tissue. In other cases, and more rarely than the preceding, the lung presents a condition known as the *catarrhal* or *white pneumonia* of fetal syphilis; this is characterized by a fatty degeneration of the lung-tissue due to extreme proliferation of the cells of the air-vesicles, which, crowding upon one another and impinging upon the surrounding lung-substance, cause the death of the latter; the lung presents an opaque-white appearance, is dense and edematous, and is marked with the imprint of the ribs with which it has come in contact. In still other cases the lungs will be found to be studded with gummata, that appear as indurated nodules having the density of hepatic tissue, of varying size and yellowish in color; at times these break down at their central points and give rise to semi-purulent collections that may be found on making sections of different portions of the lungs. A very characteristic change, that may be considered as diagnostic of fetal syphilis, is that to be noted on making longitudinal sections of the long bones. The general tendency to connective-tissue proliferation is manifested here at the lines of junction between the diaphyses and epiphyses; the embryonic tissue thus formed fails to derive sufficient nutrition, undergoes a process of retrograde metamorphosis with fatty changes, and manifests itself in irregular yellow lines separating the epiphyses from the diaphyses. *Diagnosis.*—Before the discharge of the product of conception the condition can only be suspected. After the birth of the fetus the diagnosis may be made by attention to the pathologic changes as just noted. The *prognosis* is grave for fetal life. *Treatment.*—For evident hygienic reasons syphilitic individuals should not marry until the specific taint is entirely eradicated from their systems, if this be possible; even then, after conception, the mother should be placed upon the mixed treat-

ment (protiodid and mercuric potassium iodid), and this continued throughout gestation; the fetus thus receives medication through absorption from the maternal blood, and the course of the disease in it is modified. After the birth of the child, should any of the manifestations of the disease be noted, mercurial inunctions should be made at suitable intervals.

(*d*) *Fetal Tumors.*—Malignant growths of the fetus, while rare, have been noted. They may be situated in any of the viscera, notably the liver, spleen, and kidney, but rarely reach any considerable size, although they may attain sufficient bulk to cause appreciable obstruction at the time of labor. Growths that have been noted elsewhere are unusual size of the thymus and thyroid glands (*congenital goiter*), and tumors situated in the trunk-walls, in the axillæ, or in the posterior cervical region. These may be either cystic, fatty, bony, cartilaginous, vascular, or carcinomatous, and are most commonly found over the region of the sacrum or in the perineum; here they may attain remarkable size, even that of the fetal head at term, and may produce a considerable degree of dystocia. These neoplasmata cannot be recognized before labor has begun.

(*e*) *Conditions Secondary to Maternal Disease.*—Any alteration in the state of the maternal health will speedily manifest itself in the sensitive organism of the fetus, and to a degree proportionate to the gravity of the maternal condition and the refinement of the nervous organization of the child. Thus, chronic systemic disease of the mother will become to a certain extent indelibly impressed upon the fetal constitution, while any incidental indisposition will awaken a quick response on the part of the fetus. It is owing to this peculiar and intimate relationship existing between mother and child that has arisen the custom of administering remedies to the woman in order to correct certain fetal disorders. Profound alterations in the maternal nutrition inducing varying degrees of anemia, or cer-

tain forms of systemic poisoning, such as that generated in the course of a chronic nephritis or consequent upon the introduction into the system of the salts of lead or mercury, likewise producing anemia, will react unfavorably upon the fetal nutrition or even result in fetal death, with subsequent abortion. Abrupt elevations of temperature, as in the grave fevers—typhoid and pneumonia—may very speedily result in fetal death, while temperatures equally as high, but attained by gradual stages, may be borne for a limited period with impunity. Closely allied to the effect produced by these physical conditions is the influence exerted upon the fetus by mental states and emotions in the mother. How these violent mental changes react upon the fetal constitution is somewhat of a mystery, but the result, as has been suggested, is probably the outcome of sudden alterations in the placental circulation produced by variations in the maternal blood-pressure: the shock to the fetus may be so extreme as to induce grave systemic manifestations or even entire suspension of the vital functions. Death of the mother will usually be followed by fetal death in from fifteen to twenty minutes, although one or two instances of undoubted veracity (Tarnier) are on record in which the fetus has continued to live for from one to two hours subsequent to the maternal death.

2. **Diseases of the Digestive System.**—*Pancreatic enlargement*, due either to some form of new growth or to a chronic, it may be specific, inflammatory process, has been noted. *Peritonitis* may be present in the fetus or may appear shortly after birth; it is consequent upon syphilitic infection or blows upon the abdomen, or may follow maternal peritonitis, the action of cold, or over-exertion upon the part of the mother. It is often accompanied by a limited amount of *ascites* that rarely causes sufficient abdominal distention to give rise to any difficulty at the time of labor. Certain *degenerations* or *neoplasms of the liver* may produce abdominal distention in the fetus. Very rarely *jaundice*

associated with maternal jaundice has been noted. Pathologic conditions of the alimentary canal, if ever encountered, must be of exceedingly rare occurrence.

3. **Diseases of the Respiratory System.**—Owing to the inaction of the pulmonary organs during intrauterine existence pathologic states of these structures are rare. *Syphilitic disease* of the lungs has been described under fetal syphilis. *Hydrothorax*, usually associated with serous effusions elsewhere, may be occasionally found: if considerable, it may constitute one form of fetal dystocia.

4. **Diseases of the Circulatory System.**—*Valvular disease of the heart* and *pericardial effusions* of varying size have been noted, and are usually fatal. *General anasarca*, when present, is dependent upon stenosis of the umbilical vessels or some variety of obstruction to the placental circulation, generally of syphilitic origin; the bulk of the fetal body may be so augmented as to present a moderate degree of obstruction to labor. *Enlargement of the spleen* may be found, either of malarial origin or consequent upon some circulatory impediment or a tumor in the organ.

5. **Diseases of the Nervous System.**—(*a*) *Maternal impressions*, or peculiarities in the mental or physical formation of the offspring dependent upon some mental shock or impression made upon the mother during pregnancy, are interesting phenomena that are not infrequently encountered. They are probably most common in the children of women whose nervous organisms are highly developed, but the exact nature of their production has not as yet been clearly demonstrated. The phenomena as noted in the fetus are generally referred by the family to some unpleasant occurrence, such as an encounter by the pregnant woman with some gruesome object or person, the hearing of some startling piece of news, or the seeing of some tragedy; but as to how far the fetal condition is due to the maternal impression received at the stated time is a mooted question. While the mode of transmission of

the impression to the fetal organism is obscure, it is undoubtedly true that curious coincidences of the kind have been noted by men whose standing is such as to add much weight to their statements, and that go to prove the existence of an occult influence between the nervous organization of the mother and the developing mental and physical organisms of the fetus. Clinically, the effects of such so-called impressions upon the fetus may be manifested in two distinct ways: in the one case there results a lack of physical, and in the other a lack of mental, development, although these two are frequently combined in one individual. As illustrations of the first class there may be noted, according to the varying degree of intensity of the impression made upon the fetal system from the lesser to the greater, the presence of nevi or mother's marks; the existence of malformations, such as the absence of members or the presence of supernumerary parts; and, finally, the production of monstrosities; in the second class the child may manifest strange physical or mental peculiarities corresponding to peculiarities in the person or object that originated the maternal impression: it may be afflicted with convulsions and other evidences of brain-irritation, or, finally, there may be an entire arrest of all mental functions and an idiotic offspring result. During the siege of Paris it is well authenticated that many pregnant women, terrified by the harrowing scenes and experiences of that time, ultimately gave birth to feeble-minded children. At best, the subject, though intensely interesting, is still largely within the realm of speculation, and nothing beyond the facts as just presented can be stated with any degree of authority. It has been suggested that the fetus may possess capacities that it subsequently loses in the normal course of development, just as it possesses organs that subsequently undergo a process of atrophy, and that the capacity to receive nervous impressions by induction may come under this category. The literature of this subject

is deplorably poor, and it would be well were every case of supposed maternal impression accurately reported, the statement to include not only the exact anatomic facts, but also whatever family history of heredity, maternal or paternal, might exist.

(*b*) *Intracranial diseases*, including pathologic alterations in the brain-substance, such as the development of brain-tumors or the occurrence of sclerotic changes, have been noted and are incompatible with fetal life. *Congenital encephalocele*, or a hernia of the brain-substance through a cranial fissure, together with an accumulation of cephalic fluid, is often encountered in connection with fetal monstrosities, and may from its bulk constitute an important form of fetal dystocia. A *cerebral meningocele* is a protrusion at any point through the cranial vault of a portion of the cerebral meninges containing more or less fluid; it is usually covered by skin or a portion of the scalp. A *hydroencephalocele* is a congenital brain-tumor protruding through some portion of the calvarium and containing meninges, brain-substance, and fluid; it constitutes the true encephalocele. In size an encephalocele varies from a minute bulging to a tumor as large as or larger than the fetal head at term; it is soft and fluctuating, and generally more or less pedunculated. It may be situated at any point upon the skull, but is especially found between the eyes or in the occipital region. The exact cause of the condition is not known; it may be due to some defect of development, to an attenuation of the cranial bones the result of internal hydrocephalus, or it may follow an intracranial inflammation with the formation of bands of adhesion. Communication may or may not exist between the encephalocele and the cranial cavity through its pedicle. *Hydrocephalus* (Fig. 99), a collection of serous fluid at some point within the cerebral substance (*internal hydrocephalus*) or outside the brain-substance (*external hydrocephalus*), preventing closure of the fontanels and causing enlargement of the skull, is not as

frequent a prenatal as it is a postnatal disease; it occurs once in about two thousand pregnancies. When it does occur during intrauterine life it constitutes an important variety of fetal dystocia. Nothing definite is known as to its etiology, although it is probably a sequel of some obscure form of inflammation of the cerebral meninges. According to some authorities, an intimate relationship exists between hydrocephalus and maternal ill health, and Herrgott claims an invariable association between hydrocephalus and cretinism. Whatever its origin, the fluid slowly accumulates within the cavities, and in order to provide room for itself distends the cranial vault, often to an immense degree, so that the bones of the skull may attain a parchment-like thinness; not infrequently do encephaloceles of varying size result as a direct consequence of this attenuation. The quantity of fluid that is present may amount to several pints. The deformity thus produced is very characteristic: the head is wedge-shaped with the base upward, and the face and lower

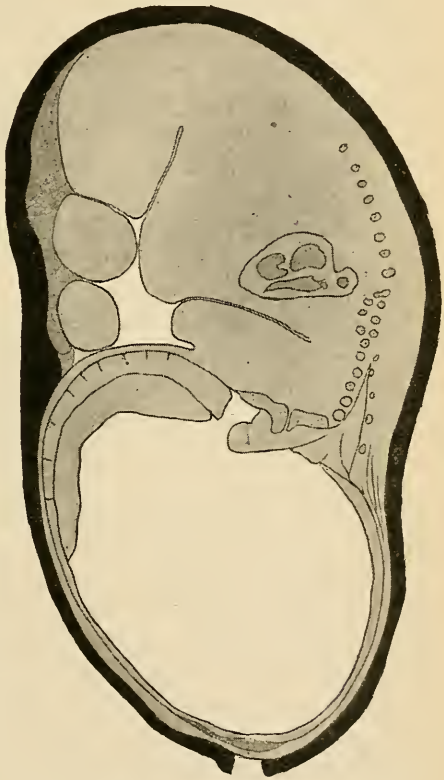

FIG. 99.—Hydrocephalus distending lower uterine segment (Varnier).

portion of the skull, retaining their normal size, present a startling degree of disproportion when compared to the immensely distended vault above; the eyes are set far in under the protruding forehead, and have their axes directed obliquely inward, so that they present a crossed appearance; the fontanels and sutures are widely distended; the remaining portions of the fetus may be well developed, but the body often presents a wrinkled and emaciated appearance. The prognosis is grave for the fetus, because of the difficulty experienced at the time of labor and because of the primary brain-lesion. *Spina bifida* may also be mentioned here, but it will be treated of under the pathology of the new-born infant.

6. **Diseases of the Genitourinary System.**—Various pathologic conditions of the kidneys and bladder have been noted as developing during intrauterine life. Among these may be mentioned hydronephrosis, cystic degeneration of the kidneys, dilatation of the ureters, extreme distention of the bladder, and exstrophy of that organ. These vary in their gravity according to the extent of the lesion and the amount of difficulty they produce at labor.

7. **Diseases of the Cutaneous System.**—Of the various forms of congenital skin-disease, probably the most interesting, though but rarely encountered, is that known as *sebor-rhœa squamosa* (*seu sicca*) *neonatorum*, *intrauterine ichthyosis*, *ichthyosis congenita*, or *fetal ichthyosis;* this is characterized by a coating of the entire surface of the fetus with thick, fatty, epidermic plates, firmly adherent to the skin, and separated by deep rhagades extending down into the corium. These plates vary considerably in size and shape, and give rise to the popular terms of "*alligator boy*" and "*collodion fetus*." Owing to the stiffness and contraction of the skin, the eyes cannot be completely opened or closed, the lips are retracted, the nose and ears are atrophied or even entirely absent, and the fingers and toes contracted and cramped, producing the condition known as *onychogryphosis*, while

the hands and feet are frequently clubbed. The color of the skin varies from a dirty-white to a yellowish-brown, while the rhagades present a more or less livid appearance; the skin is dense and hard and to the touch, and is commonly colder than normal. If not still-born, the infant soon succumbs from starvation and depression of temperature. Our knowledge of the etiology of this grave condition is deplorably deficient. As suggested by Ballantyne, there seems to be exhibited a strong family tendency to the disease; parental consanguinity also may exercise a causal action. The disease usually originates at some time toward the close of the third or during the fourth month of pregnancy. The treatment, which is applicable only to the milder grades of the disease, should consist in the removal of the scales by warm baths, followed by applications of bland substances, such as ichthyol, green-soap, and lanolin or vaselin. Artificial feeding by the spoon or *per rectum* is necessary. The grave cases usually terminate fatally within a few hours or days after birth. *Chronic cystic elephantiasis*, characterized by marked induration and the formation of multiple cystic tumors throughout the derm, is a rare congenital disease of the skin. It is very generally associated with vascular and lymphatic lesions. *Fetal keratolysis* (Ballantyne), also designated under the terms *excoriatio fœtus* or *congenital desquamation*, is a rare congenital disease of the skin, characterized by a condition of "abnormal looseness of attachment or of actual desquamation of the epidermis of the living fetus." This pathologic state may be universal or may be confined to special regions, as the hands, feet, or scrotum. The etiology of this curious disease is unknown. Ballantyne suggests that it may be entirely the result of fetal exanthematous disease (measles, scarlatina) or of erysipelas, syphilis, or pemphigus. Others suggest that it is the result of deficient nutritive power in the epidermic vessels. The denuded areas are usually of a pale salmon tint, in strong contradistinction to the bright-

red areas that are characteristic of postmortem maceration; this, however, is not absolute. The condition is a grave one, but not necessarily fatal. It is best treated by the application of bland unguents, as lanolin or vaselin, and careful and nutritious feeding.

3. Fetal Traumatism.

Curious instances of injuries to the fetus resulting from external violence to the mother during gestation have been noted. Fractures of one or more of the bones are not infrequent after severe blows upon the abdomen of the pregnant woman, and even lacerated and contused wounds of the soft parts have been observed, either shortly after the injury has been inflicted or weeks afterward, the only visible manifestations of the accident being the presence of well-formed cicatrices. *Spontaneous amputation* of fetal parts has been considered under the subject of *Amniotitis* (page 228).

4. Fetal Death.

Owing to the precarious existence through which the delicate embryo must pass for days and weeks subsequent to conception, as already noted, death of the developing ovum is of very frequent occurrence. There are numerous *causes* to which fetal death may be ascribed, and preeminent among these stands syphilis, which not only destroys thousands of ova during the early stages of gestation, but is also the cause in very many instances of death of the fetus shortly before the onset of labor. Another very prolific cause is apoplexy of the placenta, membranes, or ovum itself, dependent upon some form of inflammation of these structures, a preexisting endometritis, maternal anemia or plethora, chronic nephritis, or other chronic maternal disease. It may follow various forms of systemic poisoning, as that due to lead, mercury, or tobacco; it may result from paternal disease, from alcoholism, or from extreme age or youth of the father; while in a certain number of cases no

assignable cause may be found other than habit, the mother losing her children in successive pregnancies at about the same period of gestation.

The signs of fetal death are inconstant and deceptive: often it is impossible to state accurately whether or not the fetus still lives at any given time. A number of tests by which the occurrence of fetal death may be recognized have been offered, none of which are, however, absolutely positive, although when taken in conjunction they are strongly presumptive evidence of such an event. In about their order of value these may be named as follows: 1. Cessation of abdominal and uterine growth, followed by subsidence in the size. In ascertaining this decrease in size the following measurements should be taken: (*a*) The girth of the abdomen over the most prominent portion of the bulk anteriorly and in the hollow of the waist posteriorly; (*b*) the distance from the symphysis to the umbilicus; (*c*) the distance from the umbilicus to the xiphoid cartilage; 2. Subsidence of the signs of pregnancy; 3. Absence of the fetal heart-sounds and fetal movements; 4. Absence of pulsation in the umbilical cord or fetal precordium, as ascertained by the introduction of the hand within the uterus; 5. Decrease in the cervical temperature, which in pregnancy is normally about one degree above that of the body-temperature; 6. Occasionally the appearance of milk in the breasts, which at the same time become flaccid; 7. Some disturbance of the renal action, with, possibly, the presence of peptone in the urine; 8. Cranial crepitus, only to be found in cases in which the fetus has been dead for a considerable period and the head has undergone a certain amount of maceration, so that the bones are loosely fastened together; 9. *Stoltz's sign*—a peculiar rustling sound, of doubtful existence, said to be heard in case of fetal death, and supposed by Stoltz to be due to gaseous decomposition of the liquor amnii.

Postmortem Changes in the Fetus.—According to the period at which fetal death has occurred, the length of

time during which the deceased product is retained in the body, and as to whether or not there is access of air to the gestation-sac, will depend the retrograde changes that take place in the fetal structures after death. The following changes, in about the order of frequency in which they are encountered, have been noted: (1) *Maceration*, occurring only when the membranes have not been ruptured, is a softening and nonputrefactive decomposition of the fetus resulting from the action of the liquor amnii upon the skin primarily, and subsequently upon the deeper tissues, the protective influence of the vernix caseosa no longer being exerted. A fetus that has undergone this change is designated as a *fœtus sanguinolentus*, and presents a very characteristic appearance. Owing to the absorption by the amniotic fluid of the coloring-matter of the blood and the products of tissue-decomposition, this fluid is greatly discolored, being reddish, greenish, or brownish in color, and at times somewhat offensive in odor. The surface of the fetus is softened and wrinkled, and may present the characteristic appearance of the washerwoman's hand; scattered over the body are patches of varying size of a glistening red appearance, produced by the desquamation of the epidermis at these points; they are most marked upon the abdomen and extremities; the deeper tissues are soft, flabby, and edematous, and easily displaced from the bony structures; the articulations are loose and the extremities may be readily disjointed; the internal organs are infiltrated, edematous, and friable, the cranial bones widely separated and very mobile; the cord is rounded, soft, and spongy, without exhibiting any of the normal coiling; and the placenta and membranes are pulpy and edematous. (2) *Absorption.*—This is the so-called spontaneous cure of extrauterine pregnancy, but it is also known to occur after early fetal death in intrauterine pregnancy. It can only take place before the third month of gestation, and consists in a maceration and ultimate complete absorption of the

fetal parts by the liquor amnii, so that not a trace of them can be found; the only peculiarity consists in a thick and gummy condition of the amniotic fluid. (3) *Mummification*, a change only possible before rupture of the membrane has occurred, and occasionally noted when fetal death has followed a slow process of inanition, especially after the fourth or fifth month of gestation. A mummified fetus presents a shrunken, shrivelled, and dried-up appearance, and is of a deep-yellow color and leathery consistence: if it occur in a twin pregnancy, the mummified fetus is usually flattened by pressure from the growing fetus; there is a notable absence of areolar tissue throughout the body; the fetal appendages are dried and tough and show traces of fatty degeneration. (4) *Putrefaction*, due to the entrance of air carrying with it the germs of decomposition. There results the condition known as *physometra* or *tympanites uteri*, on account of the tympanitic note elicited when percussion is made over the gaseous uterine tumor. The soft structures are removed by the process of disintegration, and the bones are retained, to eventually ulcerate their way through the wall of the gestation-sac, or are removed by operative procedure. (5) *Adipoceration* and *saponification*, varying degrees of one and the same condition, in which the fetal structures undergo a fatty or soapy change, and acquire a peculiar greasy feel from a deposit within them of cholesterin and sodium, potassium, and calcium margarates. (6) *Calcification*, or the deposit of lime-salts in the tissues, producing a hard and stony condition; such a calcified fetus is termed a *lithopedion* or "*stone child*."

Treatment.—In any case in which there has been retention of the deceased fetus, with the supervention of one or other of the foregoing changes, treatment consists in the induction of abortion or premature labor with removal of the contents of the uterus. If it be a case of extrauterine gestation, the treatment is abdominal section with removal of the gestation-sac under antiseptic precautions.

III. THE PATHOLOGY OF PREGNANCY.

So manifold are the pathologic possibilities to which the pregnant woman is exposed that few pass through the period of gestation without experiencing some one or more of the troublesome complications now to be enumerated. Many of these are of no significance as concerns risk to mother or child, while others are of the gravest import and may determine fetal or maternal death, or both. The entire organism of the woman sympathizes with the unusual state of the organs of generation, and to the undue sensitiveness thus engendered may be ascribed the many reflex pathologic manifestations and neuroses that beset the childbearing period. To the affections thus reflexly brought about must be added the various accidental complications of pregnancy that exert a more or less baleful influence upon the gestation or are themselves modified in their clinical phenomena by the coexisting physiologic condition.

1. General Diseases.

(1) **The Zymotic Diseases.**—The zymoses, while not exhibiting any marked predilection for the period of pregnancy, may all complicate gestation, and be modified by it in such a manner as to assume in many instances almost a malignant type. Generally they run an exceedingly acute course and terminate the pregnancy prematurely. In many instances they react so severely upon the maternal system as to induce rapid dissolution either from excessive systemic poisoning, profound shock, or the attendant accidents of the abortion. The discharge of the ovum should, however, be regarded as a beneficent measure intended by nature to assist in eradicating from the maternal system a portion of the morbific substance, and, as such, prophylactic measures should not be instituted. Some of the zymotic diseases are more prone to attack a pregnant woman, and are more

radically altered thereby in their clinical course, than are others. Among the *eruptive fevers, variola* assumes pre-eminence in this respect; it is the one most commonly encountered in the pregnant woman, and may be regarded as the most virulent; it generally results speedily in both fetal and maternal death. Should pregnancy not be terminated prematurely and the mother survive, the fetus upon birth will generally show marks of the ravages of the disease. The prognosis will depend upon the period of pregnancy at which the complication occurs and the type of the disease; it is much more grave when occurring near term and when the disease assumes the confluent form. *Scarlatina* is of much less frequency in pregnancy than is variola, but, like it, is exceedingly virulent; as a rule, early abortion with maternal death from profound intoxication ensues. The disease most commonly attacks primiparæ, and much more frequently in the puerperal than during the gestational period. The most prominent symptoms are fever, eruption, vomiting, diarrhea, and albuminuria. The treatment should be mainly antipyretic and sustaining. *Measles* usually assumes a very severe type when occurring under these circumstances; abortion is the rule, and the patient manifests a marked tendency to the development of pneumonia and puerperal hemorrhage; death occurs in a considerable proportion of the cases. The treatment should be supporting and antipyretic, and special attention should be paid to the pulmonary condition. *Typhoid fever* is most common in the earlier months of pregnancy, and very generally results in abortion; the nature of the disease is not materially altered by the physiologic condition. *Typhus fever* is rarely seen, and does not often assume an aggravated form nor does it tend to terminate pregnancy.

(2) Among the other *specific diseases* that may complicate pregnancy must be mentioned Asiatic cholera, influenza, intermittent and relapsing fevers, and syphilis. *Cholera* is not a frequent complication of pregnancy, but when it does

occur it is apt to result in premature expulsion of the ovum and frequently in the death of both mother and child, the latter from asphyxiation; it is most common in the later months of pregnancy. *Influenza* usually results in abortion, either directly from the action of the specific poison or indirectly from the spasmodic action consequent upon the violent coughing. *Intermittent fever* is of rather infrequent occurrence in pregnant women, and rarely terminates pregnancy prematurely; its course is atypical; the treatment is the same as under other circumstances, save that the quinin must be administered in larger doses. *Relapsing fever* has been noted; it is rare, however, and is most frequently encountered during the early months of gestation. *Syphilis* may be contracted by the mother prior to, at the time of, or subsequent to conception, and according to the time of infection will depend the effect upon the fetus; in case of the contraction of the disease during pregnancy the fetus may or may not inherit the malady. A healthy mother may acquire the disease in its secondary form from a fetus that has become infected through a diseased spermatozoid. In all cases in which syphilis complicates pregnancy there is manifested a marked tendency to abortion; in fact, an exceedingly large percentage of abortions may be traced to this disease. A curious feature of syphilis contracted at the time of conception is the extreme virulence of the initial lesion and the remarkable mildness of the later lesions; the disease seems almost to exhaust itself in the virulence of its primary manifestations; these assume a phagedenic character, and may spread over a large surface of the vulva, vagina, thighs, and buttocks. The treatment of this condition should be both local and constitutional. The mixed treatment must be pushed to the point of salivation, and, locally, drying and sedative applications should be continued until the lesions disappear; tonics and nutrients are always indicated.

2. Diseases of the Digestive Tract.

(1) **Gingivitis**, the inflammation of the gums that is occasionally encountered in pregnancy, is a curious condition and one that is very rebellious to treatment. The gums are swollen and spongy, painful to the touch, readily bleed, and are at times ulcerated; usually there is a foul odor to the breath. In aggravated cases the ulceration may extend to the other structures of the mouth or even down the esophagus to the stomach. Generally the condition disappears upon the birth of a child, but in exceptional cases it may be protracted thoughout the period of lactation. The *treatment* consists in the employment of tonics internally, and astringent mouth-washes, as listerin and tincture of myrrh.

(2) **Dental Caries.**—During the progress of gestation there is frequently developed a rapidly progressive caries of teeth that had previously shown no signs of decay; this may or may not be accompanied by severe toothache. It is especially prone to occur in women of the higher social ranks, and its cause is believed by some to be an acidity of the secretions of the mouth consequent upon the acid dyspepsia that is so common in pregnancy. If it develop late in gestation, nothing in the line of treatment should be done until after parturition, for fear of the induction of abortion, unless the suffering becomes severe, when the decayed tooth may be removed or the cavity treated. Should it appear early in pregnancy, supervision by a dentist becomes imperative.

(3) **Salivation** or **ptyalism of pregnancy** is a curious neurotic condition occasionally noted during the course of a gestation and characterized by a hypersecretion of saliva, the amount expectorated amounting even to two or more quarts in the twenty-four hours. There is a constant dribbling from the mouth, to the great annoyance of the patient, and the drain upon the system may be so severe as

to cause a rapid decline in the general health. The affection is most commonly observed early in pregnancy, and disappears as gestation advances, usually not persisting longer than from eight to ten weeks. Occasionally it may be protracted to term, and the condition of the patient then becomes truly pitiable. Some women develop this condition with each pregnancy. *Treatment* is at the best unsatisfactory. The best results may be obtained from the use of nerve-sedatives, as the bromids and chloral. Ergot has been employed, as have also astringent gargles and lozenges, atropin in doses of $\frac{1}{100}$ of a grain, belladonna, minute doses of pilocarpin, the fluid extract of viburnum prunifolium, galvanism of the parotids, and blisters and other forms of counter-irritation over the regions of the salivary glands. None of these remedies will answer in every instance, but the combined use of two or more may succeed when one has failed.

(4) **Anorexia.**—It is very common for a pregnant woman to exhibit more or less loathing for special forms, or even in rarer cases for all forms, of food. This has been especially noted at the beginning and toward the close of pregnancy, when the neurotic element in the patient is most prone to manifest itself. In some cases it may take the form of an intense disgust for meats of all kinds, while in other cases meats alone can be tolerated. There is no special mode of *treatment* that can be suggested to meet this condition; in each instance it is wise, as a rule, to permit the patient to select the food that is most to her liking. If the loss of appetite be due to gastric, hepatic, or intestinal torpidity, appropriate remedies in the form of tonics, cholagogues, or laxatives may be given with beneficial effect.

(5) **Pica (Malacia).**—A craving for unnatural and strange articles of food, a peculiar perversion of taste, is frequently encountered in pregnancy, and is then popularly known as "longings" or "pining." In exceptional cases this may amount to a true form of insanity, the most disgusting or

even injurious substances being devoured with avidity. Moral suasion, with mental diversion and regulation of the diet and the alimentary tract, is all that can be attempted in the line of treatment. The condition disappears with the termination of the pregnancy.

(6) **Indigestion, Gastric and Intestinal.**—Very generally, and particularly in primiparæ, there will be manifested during the childbearing period more or less gastric and intestinal derangement. Pyrosis or heartburn, with acid eructations, most marked late in pregnancy, is the main characteristic of gastric, while enteralgia in varying degrees characterizes intestinal, indigestion. The *treatment* consists in the administration of pepsin, magnesia, sodium bicarbonate, aromatic spirits of ammonia, powdered calumba, and alkaline waters such as Vichy, an occasional laxative, and regulation of the bowels.

(7) **Pernicious Vomiting of Pregnancy (Hyperemesis gravidarum).**—Of extreme importance and gravity is the condition recognized as an exaggeration of the physiologic nausea and vomiting of pregnancy: so long as it constitutes merely an exaggeration of the symptom of gestation, assuming unusual prominence without materially affecting the health of the patient, it need not excite apprehension. Unfortunately, however, it occasionally exceeds this limit, and then assumes such a degree of gravity as even to menace life. The physiologic symptom, which, as a rule, begins shortly after conception, has generally subsided by the time quickening has occurred; in the exceptional cases now under consideration it may be protracted long beyond this period, with continued duration assuming increasing severity. *Etiology.*—There are many factors that may contribute to the development of this condition, although just what is the cause in any given case cannot always be definitely stated. Taken in about the order of frequency, these causes may be grouped as follows: (*a*) A reflex neurosis resulting from excessive distention of the uterine walls

with irritation of the peripheral nerve-endings therein contained. Naturally, one would expect to find, as is the case, the condition more common in primiparæ, in whom distention of the womb is accomplished with greater difficulty on account of the greater tonicity of the muscular fibers, and in multiple pregnancy, in which condition the distention must proceed at a more rapid pace and to a more considerable extent; (*b*) Chronic preexisting disease of the uterus, as a cervical or corporeal endometritis, a chronic metritis, or some form of uterine displacement; (*c*) Preexisting or coexisting pelvic disease, as a salpingitis, a pyosalpinx, an ovaritis, or an appendicitis; (*d*) Some pathologic state of the alimentary canal, as dyspepsia, chronic gastritis, and, more rarely, gastric ulcer; and intestinal disease, as mucous polyps, or stenosis from inflammatory adhesions without the canal, all of which would be aggravated by the neurotic element that assumes prominence during gestation. (*e*) Too frequent sexual intercourse; (*f*) Profound emotion; (*g*) When the disease manifests itself late in pregnancy (after the sixth or seventh month) it is very generally due to nephritic trouble with uremic manifestations; this is termed the *recurrent vomiting of pregnancy*. *Symptoms.*—The disease, which commences as the ordinary morning sickness, steadily increases in severity until there is an almost continuous retching and vomiting of a bile-stained, often blood-streaked and intensely acid mucus; the mere sight of food or a change in the position of the patient may be sufficient to induce emesis; the patient grows extremely weak and is subject to attacks of syncope; her lips become fissured and covered with sordes; she rapidly emaciates; and there are variations in the temperature, which may be either slightly elevated or subnormal; the skin becomes harsh and shrivelled; intestinal and gastric pains are common; there is epigastric tenderness; salivation has been noted, and constipation is the rule; the gums are swollen and the teeth coated with sordes; there are intense thirst, a dry and coated tongue,

and a foul odor to the breath; the pulse is soft and rapid; the respiration is accelerated; there is increasing restlessness with insomnia; and the extremities are cold and clammy; the urine is scanty, highly colored, albuminous, and frequently contains casts. The patient steadily grows worse; toward the end the face becomes pinched and blue, the eyes sunken, the vomiting ceases, severe neuralgic pains develop, delirium often supervenes, subjective sensations as of unpleasant odors or strange sounds may be complained of (Horwitz), and the woman dies in a comatose condition of profound inanition. In some cases the violent expulsive efforts associated with the vomiting are sufficient to produce abortion, whereupon the unpleasant gastric symptoms promptly subside. The *diagnosis* of the condition is easy; the *prognosis* is grave, the mortality being high. *Treatment.*—The treatment may be hygienic, medicinal, and operative. The *hygienic* treatment consists in ascertaining and removing any known or probable cause, and the regulation of the diet and of the general mode of living. A simple change of scene may work a cure. Should there be found to be present a catarrhal condition of the cervical canal, appropriate treatment would consist in the application of ichthyol, hydrogen peroxid, Churchill's tincture of iodin (Routh's method), or a weak solution of silver nitrate (from 10 to 30 grains to the ounce); if the vagina and cervix be hypersensitive, this may be overcome by judiciously applying a solution of cocain of from 10 to 15 per cent. strength. Sexual intercourse must be strictly prohibited; the bowels must be kept patulous; all odors of cooking should be prevented from gaining access to the patient; any articles of diet to which she has taken an especial aversion should be banished from the diet-list, while if there be any suitable article of diet for which is developed a longing, it may be supplied. The patient may be instructed to sip a glass of sherry-wine, iced milk with lime-water, ice-cold koumiss, iced champagne, or strong coffee before

rising. She should be instructed to take as much rest as possible. The *therapeutic measures* that have been recommended in the management of the condition are many, and their very number proves their generally unsatisfactory action. Probably the best that may be used are—cocain (a 1 or 2 per cent. solution), applied locally to the throat or in small doses (from $\frac{1}{8}$ to $\frac{1}{4}$ of a grain) internally each hour until from $\frac{1}{2}$ to 1 grain has been taken; menthol, $\frac{1}{2}$ gr. each hour; nerve-sedatives, as from 5 to 10 grains of chloral by the mouth or from 20 to 30 grains *per rectum*, and sodium or potassium bromid in 10-grain doses three or four times daily; dilute hydrocyanic acid, in 3- to 5-minim doses; ingluvin, in from 10- to 15-grain doses; silver nitrate, in from $\frac{1}{8}$- to $\frac{1}{4}$-grain doses four times daily; tincture of nux vomica, from 5 to 10 minims; creasote, from 1 to 2 minims daily; oxalate of cerium, 10 grains three to four times daily; antipyrin, in from 5- to 10-grain doses; wine of ipecac or Fowler's solution, in from $\frac{1}{2}$- to 1-minim doses; and strychnin sulphate, gr. $\frac{1}{40}$ to $\frac{1}{20}$ twice or thrice daily. Hypodermically may be given hyoscin hydrobromate $\frac{1}{120}$ grain, or morphin sulphate gr. $\frac{1}{8}$ to $\frac{1}{4}$. Various local applications may be tried, prominent among which may be mentioned a laudanum-poultice or an ether-spray to the epigastrium, faradism of the stomach, ice to the posterior cervical region, or a few leeches to the epigastrium. Some accoucheurs advocate very highly vesication over the fourth and fifth dorsal vertebræ, claiming that a single application is sufficient to terminate the vomiting. Inhalations of oxygen may be beneficial in some cases. If the patient grow steadily worse notwithstanding these hygienic and therapeutic measures, it will then become necessary to abstain from all food by the mouth and to resort to rectal alimentation. A nutritive enema containing some predigested food may be given three or four times daily, the bowel being thoroughly washed out immediately before introducing the enema. Suitable materials for this pur-

pose are pancreatized milk, partially digested meat or eggs, liquid peptonoids, beef-serum, defibrinated blood, or one of the following special formulæ: 1. *Rennie's Formula.*—Add to a bowl of good beef-tea ½ pound of lean raw beefsteak pulled into shreds; at 99° F. add 1 dram of fresh pepsin and ½ dram of dilute HCl; place the mixture before the fire and let it remain for four hours, stirring frequently; the heat must not be too great or the artificial digestive process will be stopped altogether; it is better to have the mixture too cold than too hot; if alcohol is to be given, it should be added at the last moment; eggs may also be added, but should be previously well beaten. 2. *Leube's Pancreatic-meat Emulsion.*—Chop five ounces of finely-scraped meat still finer, add to it 1½ ounces of finely-chopped pancreas, free from fat, and then 3 ounces of luke-warm water; stir to the consistence of a thick pulp; give at one time, care being taken to wash out the rectum with water about an hour before. 3. *Maret's Formula.*—Fresh ox-pancreas 150 to 200 grams; lean meat 400 to 500 grams; bruise the pancreas in a mortar with water at a temperature of 37° C., and strain through a cloth; chop the meat and mix thoroughly with the strained fluid, after separating all the fat and tendinous portions; add the yolk of one egg; allow to stand for two hours, and administer at the same temperature, after having cleansed the rectum with an injection of oil; this quantity is sufficient for twenty-four hours' nourishment, and should be administered in two doses. 4. *Peaslee's Formula.*—Crush or grind a pound of beef-muscle fine; then add a pint of cold water; allow it to macerate for forty minutes, and then gradually raise it to the boiling-point; allow it to boil for two minutes and then strain. 5. *Flint's Mixture.*—Milk 2 ounces, whisky ½ ounce, to which add half an egg. The amount administered by rectum at any one time should not exceed from 4 to 6 ounces. Generally under this treatment the patient will commence to improve and slowly recover. It

occasionally happens, however, that even these energetic measures fail, and all that is then left is the so-called *operative treatment*, embracing *Copeman's method* of cervical dilatation, and finally the induction of abortion. The former consists in carefully dilating the cervix under antiseptic precautions, either with the finger slowly introduced up to or slightly within the internal os, or with an instrument judiciously used, not exceeding half an inch of dilatation. This maneuver has been successful in a large number of cases, and should be employed before the fetal life be sacrificed. If this should fail, there remains but the one course—namely, the induction of abortion according the method already given.

(8) **Constipation.**—The normal intestinal torpidity of women is very generally aggravated by gestation. This has a duplex cause: it may be partly mechanical from occlusion of the bowel by the enlarged and growing uterus, and it may result in part from impaired peristalsis due to alteration in the innervation of the bowel. If untreated, the degree of torpidity may become excessive: women have been known to pass from seven to ten days or more without defecation, vast fecal accumulations taking place in the mean time. There is frequently associated with this intestinal inactivity more or less of the symptoms of copremia—headache, fulness of the veins, giddiness, and retarded cerebration. The *prophylactic treatment* should consist in the proper use of laxative food-stuffs to overcome the natural tendency in this direction. When fully developed, laxative remedies, such as the pill of aloin, strychnin ($\frac{1}{60}$ gr.), and belladonna at bedtime, the extract of cascara sagrada ($\frac{1}{2}$ gr.), compound licorice-powder, cascara cordial, Hunyadi or Friedrichshalle water, inspissated ox-gall, 1 to 2 grains in combination with the extract of belladonna ($\frac{1}{4}$ gr.), or rectal enemata of soap-suds must be employed. In extreme cases of fecal impaction it may become necessary to empty the rectum by means of a spoon or spatula, following this by an enema

to remove the material from the upper portion of the colon.

(9) **Diarrhea** is much rarer than the preceding, and is usually due to dietetic errors, although irritability of the bowel from mechanical pressure of the pregnant uterus may result in hyperperistalsis, with the discharge of the watery constituents of the canal. If unchecked, it may excite uterine contraction and result in premature discharge of the ovum. The *treatment* consists in the administration of astringents, as chlorodyne, chalk-mixture, and aromatic sulphuric acid, and in cases in which there is a strong nervous element the nerve-sedatives and the bromids.

(10) **Hemorrhoids** constitute a not-infrequent complication of pregnancy and a source of untold suffering to the patient. The condition is in part due to the constipation and in part to mechanical obstruction to the pelvic circulation from pressure of the gravid uterus upon the hypogastric and hemorrhoidal veins. The *treatment* consists in the employment of mild laxatives to relieve pelvic congestion, preferably a sulphur pill or a pill containing aloin and extract of belladonna, and local astringent remedies in the form of suppositories; one that has been of much service contains tannic acid from 5 to 10 grains, extract of belladonna ¼ of a grain, and aqueous extract of opium ½ grain.

(11) **Jaundice (Icterus gravidarum).**—Jaundice, though rarely complicating pregnancy, may occur in one of two forms. It may manifest itself as a simple discoloration of no significance other than indicating a catarrhal condition of the biliary passages or a slight obstruction to the hepatic circulation and flow of bile from mechanical interference with the vessels and ducts; or it may assume malignant qualities dependent upon an acute yellow atrophy of the hepatic cells, and in this case rapidly terminate fatally. The former condition is prone to develop into the latter when occurring during pregnancy, for several reasons, which, according to Davidson, may be stated as follows:

(*a*) Retention of the bile-acids and other effete products in the blood as a result of impaired renal activity, with fatty degeneration of the liver-cells due to their presence; (*b*) impairment of the resisting powers of the body due to the impoverished condition of the blood; (*c*) impeded cardiac action from vasomotor spasm produced by the toxic material in the blood, with consequent ill-nutrition of the liver-substance; (*d*) over-activity of the hepatic cells, resulting in rapid degeneration of the substance. The condition may develop from a variety of causes, physical and mental, as grief, fear, the ingestion of indigestible substances, the action of miasmata, and exposure to a high temperature. It may result in a certain proportion of cases from direct mechanical pressure by the gravid uterus or by the overloaded transverse colon upon the ductus communis choledochus. Not uncommonly abortion follows an acute attack of jaundice, and in some cases malignant symptoms rapidly develop upon the discharge of the ovum. The *treatment* of the catarrhal form is largely hygienic, together with the administration of calomel, podophyllin, and other cholagogic remedies; nothing can be done in the malignant form, which invariably terminates fatally.

3. Diseases of the Respiratory Tract.

(1) **Hyperosmia.**—A morbid acuteness of the sense of smell may be developed during gestation, especially in women of a strong neurotic tendency. In some instances it may become so pronounced as to constitute an etiologic factor in the production of the hyperemesis of pregnancy. In such cases strongly odoriferous substances that are acceptable to the patient should be kept in her vicinity to destroy the unpleasant odors and thereby prevent the development of the grave gastric condition.

(2) **Dyspnea of pregnancy (asthma gravidarum)** is a neurotic condition most commonly encountered early in pregnancy and in women with a highly-developed neurotic

tendency. It is very intractable to treatment, and may only disappear at the termination of gestation. The symptoms are those of severe spasmodic asthma. The *treatment* consists in the administration of nerve-sedatives (chloral and the bromids) in full doses. *Mechanical dyspnea*, resulting from impeded action of the lungs and heart due to upward displacement of the diaphragm, is a late symptom of pregnancy, and continues until "lightening" occurs. Light regimen, the wearing of loose clothing, and the avoidance of constipation will ameliorate the symptom.

(3) **Nervous** or **spasmodic cough** is a term applied to a reflex nervous manifestation, without associated laryngeal or bronchial disease, very frequently developed in neurotic women, and often the source of considerable discomfort to them and of anxiety to the family. There are no attendant symptoms. The paroxysms of coughing may, if severe, induce an abortion. Like the other nervous manifestations of pregnancy, this condition is intractable to treatment. The only remedies of service are the antispasmodics and nerve-sedatives—the bromids, chloral hydrate, hydrocyanic acid, valerian, and asafetida.

(4) **Emphysema** is very commonly encountered in pregnancy, and, in consequence of the hydremia and mechanical interference with respiration, is prone to assume an aggravated form. The associated cardiac dilatation adds to the gravity of the case, and the condition may become so threatening that the induction of abortion alone will relieve the patient. It is not uncommon for spontaneous abortion to follow the exaggerated efforts at respiration. Cardiac and respiratory stimulants and the inhalation of oxygen may alleviate the suffering to a certain extent.

(5) **Croupous pneumonia** when developed during the course of a pregnancy constitutes a grave complication. Not only are its symptoms aggravated by the physiologic condition, but in return it reacts unfavorably upon the gestation, and not infrequently terminates it prematurely. It

is said that 60 per cent. of these patients will die, probably from pulmonary edema secondary to acute heart-failure or from hyperpyrexia. Should the disease occur late in gestation and labor supervene, excessive stimulation of the patient will be required to counteract the extreme tendency to collapse that will be manifested. For this purpose whisky or brandy in large amounts, tincture of digitalis in full doses, tincture of strophanthus, quinin, aromatic spirit of ammonia, or ammonium carbonate may be exhibited. When full dilatation of the os has occurred, rapid instrumental delivery must be performed to avoid further exhaustion from voluntary expulsive efforts.

(6) **Pulmonary Tuberculosis.**—While this disease, except in the advanced stages, does not exert any specially baleful influence upon gestation, it is itself very unfavorably influenced by the physiologic state. There is frequently an arrest of the pulmonary symptoms during the period of gestation, consequent upon the plethora that very generally is present at that time; in many instances, however, not only does this amelioration of the symptoms fail to occur, but there is even in those already suffering from the disease an aggravation of the pulmonary conditions, and a rapid decline in strength and health in those affected with latent tuberculosis or who inherit a pronounced tendency to the affection. After the birth of the child there invariably occurs a rapid progress of the disease with early fatal termination. Acute miliary tuberculosis is always rapidly fatal. In all instances of suspected or latent tuberculosis marriage should be strongly discountenanced: if pregnancy ensue, superalimentation and the administration of tonics (iron, quinin, arsenic) and cod-liver oil will constitute the treatment. Lactation should not be permitted, as well for the safety of the child as with the object in view of husbanding the strength of the mother.

4. Diseases of the Circulatory System.

(1) **Cardiac palpitation** is a functional disorder of the heart of slight significance, dependent generally upon a neurotic habit, exaggerated, it may be, by some gastric or gastrointestinal disturbance, but occasionally due to mechanical interference with the heart's action from the overdistended abdomen. It is not serious in its consequences, but may give rise to much discomfort to the patient. Nerve-sedatives and antispasmodics will largely control it.

(2) **Syncope** is an hysteric manifestation in eminently neurotic women, and is most marked in those patients who do not present other and more common reflex phenomena. Such women are apt to develop fainting-fits at any time throughout the course of pregnancy, but especially so at or near the time of quickening; these spells are pseudofainting fits—that is, there is generally not a complete loss of consciousness. Owing to their evident neurotic origin, the administration of such remedies as valerian, asafetida, sumbul, chloral, and the bromids will most promptly control the attacks; these measures may be supplemented by the use of tonics and a nutritious regimen.

(3) **Hydremia** (**serous cachexia, serous plethora**) is a watery condition of the blood characterized by a considerable increase in the fluid constituents without decided decrease in the solid components. A certain amount of hydremia in pregnancy is physiologic, but in many instances this becomes exaggerated to such an extent as to constitute a true pathologic condition. Owing to the large amount of fluid circulating in the vessels, hydremia was formerly looked upon as a variety of plethora, and this view was sustained by the great similarity of some of the clinical manifestations of the two affections; as, for instance, the full, bounding, and frequent pulse, the ringing in the ears, vertigo, and local flushings, which are as pronounced in hydremia as in true plethora. An examination of the blood,

however, reveals the correct state of affairs: it is found to contain an excess of serum with a diminished number of corpuscles, associated with a lessened amount of albumin and of iron and an increased amount of fibrin. When withdrawn from the vessels, such blood forms a small and imperfect clot surrounded by a large amount of pure serum. The physical condition of the blood, therefore, closely simulates the state of the blood in chlorosis. The total amount of fluid present is very frequently much increased above the normal. The *causes* of this hydremia lie in the alterations in the metabolism of the body, in derangements of the alimentary canal, and in the presence in the blood of effete products from both mother and child. The *symptoms* are a sense of fulness in the vessels; marked pulsation of the arteries, especially those of the neck and head, of which the woman may complain very bitterly; a sensation of heaviness in the head; occasional vertigo and ringing in the ears; flashes of heat over the body, and especially in the head; imperfect vision; drowsiness; cephalalgia and varying degrees of dyspnea, most marked upon exertion. There are associated nervous phenomena, as attacks of syncope, neuralgias in various portions of the body, and alterations in taste and manners; the appetite is impaired and capricious, the digestion imperfect, the bowels constipated. The local flushings that are so marked in the cephalic region may also be manifested in other parts of the body; thus there may be phenomena localized in the pelvis and abdomen—tension and swelling of the abdomen, a sense of pelvic weight, dull aching pains in the sacral region, in the groins, and in the upper portion of the thighs, increased leukorrhea, and a diminution in the fetal movements, probably consequent upon alterations in the placental circulation; in addition, localized congestions of various organs may result in some of the accidental hemorrhages that have been noted in these cases, such as hemoptysis, hematemesis, epistaxis, or placental apoplexy: should there be developed a certain

amount of renal inactivity, some uremic manifestations may be noted. A somewhat frequent late complication of hydremia, usually appearing after the sixth month of gestation, is the effusion of a serous fluid into the cellular tissue of the body or into the body-cavities, or both, constituting a general anasarca. Very often this is confined entirely to the lower portions of the limbs, but in many cases it will slowly extend from below upward to the external genitalia, to the trunk and arms, and even to the face. At first the edema disappears during recumbency, but it becomes persistent if the hydremic condition be very pronounced. In the advanced cases there are occasionally noted effusions into the peritoneal and pleural sacs, and also into the fetal membranes, constituting a form of hydramnios. The degree of ascites present may be extreme, even sufficient to mask the uterus, and by adding to the dyspnea natural to pregnancy may greatly inconvenience the patient. Various reasons have been advanced to account for the production of the serous infiltrations of hydremia; the most probable, as stated by Tarnier, are a diminution in the albuminous constituents of the blood, an increase in the serous portion (*serous plethora*), and, locally, obstruction of the circulation from mechanical pressure by the gravid uterus. The *diagnosis* of this condition is plain if the history of the patient be considered, and this supplemented by a careful analysis of the blood. The *prognosis* is good, as a rule. The symptoms very quickly subside upon the termination of pregnancy, and the edema is rapidly removed. In exceptional cases, in which the serous effusions occur early, it may become necessary to end the gestation prematurely in order to save the maternal life. The *treatment* is essentially that of anemia: it consists in a rich and nutritious diet, largely of milk; the administration of iron, quinin, and arsenic; and, to overcome local congestions, the judicious employment of local bloodletting (dry or wet cups; over the back sinapisms or blisters); for the edema

(local or general) will be indicated diuretics, mild laxatives, and diaphoretics, the recumbent posture with the limbs elevated, and small incisions or punctures to permit of the escape of the fluid from the distended cellular tissues of the limbs: if the ascites be extreme and dyspnea pronounced, some of the fluid may be withdrawn by means of an aspirator, the patient being warned of the possibility of abortion or peritonitis following. Thoracentesis may be required for large pleuritic effusions.

(4) **Pernicious or Progressive Anemia of Pregnancy.**—This is a profoundly anemic condition, fortunately but rarely developing in the pregnant woman, but when once established steadily progressing with the gestation until death from inanition be imminent or actually occur. This grave disease differs from the preceding in not being associated with the serous plethora of that condition, nor with the production of serous effusions in the tissues or cavities of the body beyond a slight amount of edema of the lower extremities. An examination of the blood reveals a moderate degree of hydremia, a diminution in the amount of the albumin, and a marked decrease in the number of the red blood-corpuscles. The *causes*, though often obscure, may be a preexisting anemia or chlorosis, resulting either from systemic poisoning (such as follows long-continued malarial intoxication), from hemorrhage, from rapidly recurring pregnancies, or from insufficient alimentation. *Symptoms.*—The disease is steadily progressive; there is increasing pallor and loss of strength; the skin is yellowish and transparent; anorexia is more or less complete; there is fatigue on slight exertion; the nervous system is excitable; hemorrhages may occur from the mucous surfaces; the gums are spongy and red; the breath is foul, and the tongue coated. Various neuralgias, including headache and tic douloureux, may develop; fainting-spells and cardiac palpitation are not uncommon; a loud systolic murmur may be heard over the heart and in the great vessels;

in some cases there is marked a considerable degree of somnolence, in others more or less insomnia; vertigo and loss of memory have been noted; toward the close emaciation may be extreme, edema of the extremities develop, and the patient die, comatose, of profound inanition, which may or may not be preceded by premature discharge of the ovum. The disease may cover a period of months. The *diagnosis* is easy; the *prognosis* is anxious. The *treatment* must be largely hygienic, including a light but nutritious diet, regulation of the bowels, change of scene, and mental and physical rest. Internally, iron must be administered in some form, together with Fowler's solution of arsenic; preferably should be given Blaud's pill thrice daily, the albuminate of iron in from 5- to 10-grain doses, or the arsenate, $\frac{1}{10}$ of a grain three times daily. If the disease continue, the induction of abortion may become necessary.

(5) **Endocarditis.**—Disease of the cardiac valves (mitral stenosis and aortic insufficiency) is a serious complication of pregnancy; not only does it exert a harmful influence upon the gestation, but the disease itself under these circumstances is prone to assume an unwonted gravity. Owing to the impeded action of the heart, there invariably results a certain degree of pulmonary congestion; there is thus produced considerable dyspnea, even amounting to orthopnea; more or less edema of the lungs follows, the blood is crowded back upon the weakened heart, and sudden cardiac failure with fatal syncope ensues. This accident is more prone to occur during or directly after the birth of the child than at any period during pregnancy, and results then from the additional strain thrown upon the heart by the reflux of blood from the pelvic organs, where it is no longer needed. The blood-pressure is considerably elevated as a result of the uterine contractions, which narrow the lumen of the uterine sinuses. In addition, Phillips (*The Practitioner*, London, June, 1895) remarks that "owing to the forced expiratory position of the thorax during the throes

of labor the usual sucking up of the venous blood into the right heart does not take place regularly, and, as a consequence, more or less cyanosis of the face and fulness of the veins of the neck are noticed. After the birth of the child the abdominal pressure sinks almost immediately, and at the same time a number of large vessels are very suddenly cut off from the general circulation by the uterine contraction. As a result of this sinking of abdominal pressure there is an overfilling of the right heart, requiring considerable expenditure of force to overcome it." The overtaxed heart cannot accomplish this, and a fatal syncope ensues. Fritsch, on the other hand, suggests that as a usual result of the reduced abdominal pressure the blood remains accumulated in the large abdominal veins, and the right heart, instead of being engorged, is anemic: this view is probably incorrect. Syncope may largely be avoided by favoring free bleeding at the time of the separation of the placenta, by lacerating the cervix during the delivery of the child, or by performing phlebotomy and removing a few ounces (from 10 to 16) of blood if placental separation prove comparatively bloodless. The effect upon the gestation is likewise disastrous: the high arterial tension consequent upon the impeded circulation, with accumulation within the vessels of large amounts of carbon dioxid, frequently give rise to fetal death from rupture of the placental vessels (placental apoplexy). The *prognosis* must, therefore, be looked upon as grave. One-fourth of the fetuses will perish by abortion, while the maternal mortality varies up to 50 per cent. in chronic and severe cases. The danger of sudden fatal syncope is just as great after a premature labor as it is at term; hence, should it become necessary to artificially terminate the pregnancy, every precaution must be observed to avoid reflux of blood to the heart. *Treatment.*—The usual heart-stimulants should be administered while pregnancy lasts: if the symptoms assume such gravity as to indicate maternal danger, the pregnancy must be terminated; free bleeding at this time

must be allowed, and sudden syncope from rapid diminution in the intraabdominal pressure guarded against by the previous application of the binder, which must be tightened as the uterine contents are evacuated. Owing to the extreme dyspnea the sitting posture is more comfortable to the patient. Inhalations of nitrite of amyl, the use of nitroglycerin hypodermically, and excessive stimulation of the heart by the exhibition of caffein, strophanthus, digitalis, alcohol, and strychnin during the delivery of the child are demanded; if labor take place at term, forceps must be applied just before full dilatation of the os is secured, or the child delivered by the feet should the breech present. Ergot in these cases is strongly contraindicated, since by contracting the peripheral arterioles it increases the resistance the heart is compelled to overcome.

(6) **Varicose Veins.**—Varicosities constitute a very common accompaniment of the late stages of pregnancy, particularly in multiparæ. The distended veins are most commonly those of the thigh, leg, and rectum, but there may be an involvement of the vessels of the vulva, vagina, bladder, and broad ligaments. According to Bloom, they are very frequently most pronounced upon the left limb. The condition is either a direct result of circulatory obstruction from pressure by the gravid uterus, or it may be a sequel of the physiologic alterations that take place in the blood itself or in the vessel-walls. Thus, the increased quantity of the blood and its altered composition, together with the high vascular tension, may very readily result in the formation of varices, especially should the muscular coats of the veins be weakened by the degenerative changes, fatty or atheromatous, that are peculiar to pregnancy, and that are often produced secondarily to renal lethargy. The veins appear as prominent tortuous structures, dark blue in color, ominously jutting out from the surface of the limb, and showing distinctly by their knotted appearance the valvular arrangement of the vessels. The distention may

become so extreme as to present an alarming appearance; the patient will experience more or less pain in the limb according as to whether or not the deeper veins are involved, and there is frequently a sensation of tingling and burning in the vicinity of the varicosities. When the vulvar and vaginal veins are enlarged there will be a sense of vaginal heat and discomfort, increased leukorrhea, and some interference with locomotion. Usually the vaginal hemorrhoids are situated in the lower third of the canal and are of but small size. The vulva may be immensely swollen and distorted by the enlarged veins, and masses of intricate and tortuous varicosities larger than a man's fist may hang as a pendulous tumor from one or the other labium. Vesical hemorrhoids will produce a degree of vesical irritation, and should rupture occur will be followed by hematuria, it may be to an alarming degree. Dilatation of the hemorrhoidal veins results in the formation of hemorrhoids. That the venous structures of the broad ligaments and other pelvic organs share in the varicose condition has been amply demonstrated by operative procedures, as Cesarean section; the danger of rupture is imminent, and many of the instances of pelvic hematocele and hematoma of the broad ligaments have their origin in this condition. In many cases the patients, though suffering from varicose veins of immense size, may pass entirely through pregnancy and parturition without any complication occurring. There are, however, a number of possible accidents that must constantly be borne in mind under these conditions. First of these in the order of frequency and gravity is *rupture*. This may follow the most trivial traumatism, as a slight jar or fall, scratching of the irritated skin, or prolonged standing, or it may appear without any apparent cause; the ensuing hemorrhage may prove fatal within a few moments, or rupture may occur subcutaneously, and large extravasations of blood into the subcutaneous cellular tissue take place without fatal issue. If the

rupture occur in the vulva or vagina, as not infrequently happens during labor, a large hematoma or thrombus may be formed, more or less occluding the passageway, and constituting an obstruction to the escape of the child: such a hematoma, if large, may be the cause of fatal septicemia from suppuration of the exuded blood with absorption of the toxic principles. Another possible accident is the clotting of the blood in the dilated veins, consequent upon its sluggish flow, and resulting in irritation of the vessel-walls; a true phlegmasia alba dolens may thus develop in pregnancy, and the thrombi either undergo suppuration with the production of septic infection, or emboli may be carried to different portions of the body, possibly with disastrous effects. Finally, in rare cases the cutaneous irritation associated with the disease of the vessels may develop into a true erysipelas, or into an eczematous affection, as a result of the constant scratching that is excited by the annoying pruritus. The *prognosis* of varicose veins is good; the possible accidents, however, must be guarded against. The *treatment* is mainly protective. The vessels, if on the limbs, must be supported by elastic stockings, or, if in the vulva and vagina, by a pad and a T-bandage. The clothing should be loosely worn: an abdominal binder by supporting the heavy uterus will prevent a certain amount of obstruction of the pelvic circulation and thus prevent the development of varicosities. Prolonged rest in the dorsal position, the moderate use of mild laxatives and heart-stimulants, careful attention to the diet, and the avoidance of violent exercise or over-exertion constitute the main prophylactic measures to be adopted. In case rupture occur, direct digital compression will arrest the bleeding; this may be supplemented by the use of compresses of lint saturated with Monsel's solution. For the phlebitis and phlegmasia that occasionally develop, absolute rest, elevation of the limb, and soothing applications, as lead-water and laudanum or chloroform-liniment, are indicated; should

suppuration occur, free incision and evacuation of the pus will be required. Cutaneous irritation may be relieved by solutions of cocain and ichthyol, oxid-of-zinc ointment, vinegar and water, or carbolic-acid solutions.

(7) **Aneurysm** is rare in pregnancy, but has occasionally been noted. When encountered the usual care must be observed; the administration of potassium iodid in small doses may be of service. At the time of labor, when the os has been dilated to about the size of a dollar, forceps should be applied and labor terminated, so as to avoid the violent straining of the second stage, with the associated danger of rupture of the aneurysmal sac.

(8) **The Hemorrhages of Pregnancy (Antepartum Hemorrhage).**—The hemorrhages that may occur during gestation include: (*a*) Those dependent upon the existent hydremia; (*b*) those dependent upon placental anomalies; (*c*) those taking place from the genitalia and not the result of placental anomalies.

(*a*) Hydremic Hemorrhages.—In speaking of the hydremia of pregnancy mention was made of the tendency manifested by patients presenting this condition in a marked degree to hemorrhages from the various mucosæ in consequence of local congestions of these surfaces. Prominent among these may be mentioned *epistaxis*. This, while occasionally encountered during pregnancy, is most prone to occur during labor, and the hemorrhage may then be so profuse as to endanger life; it is quite intractable to treatment, and all that can be done is to plug the nostrils anteriorly and posteriorly and rapidly terminate labor by the forceps. *Hemoptysis* appears, at times, toward the close of pregnancy, as a result of pulmonary congestion, or, in neurotic individuals, as the result of violent disturbance of the heart's action—the so-called "*cardiac nerve-storms*" of H. C. Wood—resulting in a secondary congestion of the lungs. It rarely assumes an alarming character. Its treatment is that of the hydremia that produces it; in the neur-

otic cases the nerve-sedatives (the bromids and chloral) are indicated. *Hematemesis* is rare, and when present is generally dependent upon gastric congestion; it may result from round ulcer of the stomach. Ice to the epigastrium and tannic or gallic acid internally, with the constitutional treatment of hydremia, will generally control it.

(*b*) Hemorrhage dependent upon Placental Anomalies.—There are two varieties of hemorrhage of placental origin that may take place at some time during the last six months of pregnancy; the first and most common is placenta prævia, or unavoidable hemorrhage, and the second, the so-called accidental hemorrhage (Rigby), or premature detachment of the placenta.

1. *Placenta Prævia, or Unavoidable Hemorrhage of Pregnancy.*—This is a term applied to the condition in which the placenta is attached to that part of the uterine wall that becomes stretched as labor advances (the lower uterine segment), so that it precedes the advance of the presenting part of the fetus. This is a rare condition, said to occur but once in 1200–1300 cases of gestation. Necessarily, the gravity increases in proportion to the downward displacement of the placenta. There have been described but two main varieties—namely, the complete placenta prævia and the incomplete. The *complete* form comprises the so-called *central* implantation of the placenta, in which that organ is situated directly over and entirely covers the internal os uteri; this is very rare. The *incomplete* form is that in which the placenta is situated largely to one or the other side of the uterus, generally the right; it embraces the following subvarieties in the order of their gravity: (1) *Lateral*, that in which the placenta is attached to the lateral surface of the lower uterine segment, but does not quite extend to the margin of the internal os; as the segment dilates, detachment of the placenta may occur, with the production of slight hemorrhage; (2) *marginal*, in which the placenta extends to and involves the margin of the in-

ternal os; hemorrhage during dilatation is earlier and more profuse; (3) *partial*, in which the placenta partially occludes the internal os. *Etiology*.—The true cause of this interesting condition is not known; among those factors that are said to be instrumental in its production are the following: 1. *Uterine subinvolution* from whatever cause: placenta prævia is thus most frequently encountered in multiparæ, whose uteri are apt to be flabby and over-sized; in women who have passed through a number of pregnancies in rapid succession; in women of the poorer classes who have been compelled to have an early getting-up after labor and cannot afford time for proper involution to take place; and in those who have been the subjects of chronic endometritis; 2. *Low fixation of the ovum;* this may be due to atrophy of the decidua, causing a dropping of the ovum to the lower uterine segment; to abnormalities in the shape or size of the uterus; to a severe preexisting endometritis; to a flabby and relaxed uterus; to an arrested threatened abortion, the ovum being partially displaced by the uterine contractions, but forming new attachments in the lower portion of the uterine cavity; to fertilization of the ovum low down in the uterine cavity (Tyler Smith); or to a downward growth of the decidua reflexa, so that it becomes attached over the internal os. *Pathology*.—A curious feature associated with this affection is the varying degree of placental malformation that is generally present; this results from the uneven development of the decidual portion of the organ, which is massive and hyperplastic above, and attenuated and but poorly developed in the region of the internal os; the placenta consequently is irregular in its form; the abnormal circumstances give rise to a firm attachment of the hyperplastic portions with insufficient attachment of the attenuated portions; as a result of this abnormality the risks of hemorrhage are much increased. The organ may assume a horseshoe shape, may show thrombi of various sizes that have undergone different degrees of fatty degen-

eration, or may be almost entirely separated into two portions by atrophic processes taking place over the internal os. The funic insertion is also disturbed as a consequence of the abnormal conditions, and, instead of presenting a central implantation, the cord is generally found attached to some portion nearer one or the other side; prolapse of the funis in the incomplete varieties is therefore not infrequent. *Clinical Manifestations.*—There is but one symptom—namely, a sudden painless flow of bright-red arterial blood, without apparent cause other than its frequent correspondence to what would normally have been a menstrual period. This may occur at any time during the pregnancy from the beginning of the third month to term, but it is most common at or after the sixth month, and especially during the last month of gestation; its occurrence is earlier the more nearly the placenta is centrally implanted, while in the marginal variety there will be no bleeding until labor begins; then after the first pain or two there will occur an alarming hemorrhage, and in the intervals between the pains this will increase in amount, the quantity decreasing during the height of the pain, owing to the obliteration of the caliber of the blood-sinuses by the uterine contraction. After the appearance of the first gush of blood there will be repeated hemorrhages, with increasing frequency and in steadily increasing amounts as the pregnancy advances. Occurring prior to the onset of labor-pains, these hemorrhages are unattended with pain and are very abrupt in their appearance, the patient suddenly finding herself standing or lying in a pool of blood. In some cases there may not be a profuse discharge of blood, but a steady dribbling for days or weeks, resulting in the aggregate in an immense loss of blood, and often inducing a profound anemia. Should the bleeding be profuse or repeated at short intervals, there will ensue the constitutional symptoms of hemorrhage—vertigo, air-hunger, rapid running pulse, jactitation, cold clammy perspiration, headache,

wandering of the mind, coma, convulsive seizures, death. The *cause* of the bleeding is laceration of the vessels in the uterine portion of the placenta consequent upon partial separation of that organ; very little, if any, of the bleeding comes from the placenta itself. The cause of the placental separation is not positively known, but it is generally ascribed to a loss of proportion between the uterus and placenta, brought about either by a more rapid development of the lower uterine segment (*Cazeaux's theory*) or by an excessive growth of the placenta far beyond that of the uterine segment (*Barnes' theory*). *Physical Signs.*—Examination of the abdomen does not yield much valuable information. The stethoscope will show a low position of the placental bruit, and palpation may reveal an inability to clearly outline the fetal portions below through the additional thickness of placental tissue. Examination *per vaginam* is of more service. The cervix is found to be very soft and boggy, above the average size of the cervix in pregnancy, and situated lower in the pelvis than is usual; its blood-vessels may be felt distinctly pulsating; the canal is quite patulous (a condition never noted in normal pregnancy), and readily admits the examining finger, which may detect at the internal os the characteristic spongy and granular mass of the placenta instead of the hard fetal skull or the peculiar feel of the pelvic extremity of the fetus. The placenta may be distinguished from a blood-clot by the greater friability of the latter, which is easily broken up by the finger; ballottement is difficult to elicit. In exceptional cases the cervix will be tightly closed and present an unusual degree of rigidity (Müller). The *diagnosis* of placenta prævia is difficult, and can be made only by reference to the history of the case and by physical exploration, with the discovery of the signs just enumerated. The diagnosis of a complete from an incomplete variety may be made by sweeping the finger around within the internal os close to the uterine wall; in the incomplete variety the edge of the

placenta may be felt to one or the other side, generally to the left. The *prognosis* of placenta prævia is grave for both mother and child. The *fetal mortality* is high, probably from 75 to 80 per cent.; the cause of death is, in early pregnancy, placental apoplexy with abortion, which is painless, and in which the ovum is generally expelled in its entirety. In cases that have reached or gone beyond the period of viability death may result from inanition, from hemorrhage, from asphyxia from interruption of the placental respiratory function, or from immaturity. Another element of fetal danger lies in the fact that placenta prævia is very frequently complicated by malpositions and malpresentations necessitating operative procedure: this is due to the unusual shape of the uterus consequent upon the abnormal position of the placenta, to the fact that the placenta acts as a mechanical interference to the assumption of a proper position by the fetus, and to the great frequency of premature labor, either induced or spontaneous. The *maternal mortality* varies from 30 to 40 per cent., death following (1) from hemorrhage; (2) from shock; (3) from sepsis (increased liability to which is present from the low situation of the placenta, which favors ready access of the atmospheric germs; from the great constitutional depression of the patient consequent upon the repeated and profuse hemorrhages; from the frequent manipulations that are necessary in the management of the case; and from the decomposition of the large thrombi that form in the patulous uterine sinuses); and (4) from postpartum hemorrhage consequent upon the uterine inertia that to a certain extent always accompanies this complication, and which is due to the non-resisting nature of the presenting portion and to the muscular atrophy of the lower uterine segment resulting from the great distention produced by the placental development.

Treatment.—In placenta prævia the woman is in imminent danger of death at any moment from hemorrhage. For this reason the so-called expectant plan of treatment is only

applicable to those cases in which the patient can be retained in a maternity hospital, so that instant medical attendance may be secured if required. In the case of women not so advantageously situated the physician might readily be exposed to the charge of criminal neglect should the expectant plan of treatment be adopted and the woman perish from a sudden profuse hemorrhage. While true that it is rare for a fatal hemorrhage to occur before the seventh month of gestation, in exceptional cases it becomes necessary to induce abortion even as early as the third or fourth month in order to preserve maternal life. Should the patient first present herself after the viability of the child, consideration of the expectant plan of treatment should not be entertained for a moment; it is then the duty of the medical attendant to at once proceed to the induction of premature labor. In detail, the expectant and active treatments are as follows:

Expectant Treatment (not recommended).—The patient being under constant supervision, should a hemorrhage occur, the treatment for threatened abortion must be instituted—namely, absolute rest, elevation of the foot of the bed, and the use of opiates, fluid extract of viburnum prunifolium, and acidulated drinks; ice may be applied to the pelvic and perineal regions. Should maternal life be threatened, active interference is indicated.

Active Treatment.—This may be instituted either during the height of, or in the interval subsequent to, a hemorrhage. In either case rapidity of action during the process of delivery is most essential. If the patient be bleeding freely when first seen, the indication is to *arrest the hemorrhage*. This should be done by means of a vaginal tampon of antiseptic wool, if this can be secured, but, as haste is essential, anything that the hand can be laid upon must be forced into service. The vagina should be tightly packed with the material; the common fault is to insufficiently tamponade; the gauze or wool must be intro-

duced until there is absolutely no room to hold more; the cervical canal being filled first, then the vaginal vaults, and finally the vagina to its utmost capacity. *Colpeurysis* is favored by Braun in those cases in which the hemorrhage is not associated with rupture of the membranes; this consists in the accomplishment of dilatation through the agency of hydrostatic pressure exerted by colpeurynters (inflatable rubber bags) of various sizes introduced into the external os; these bags control the hemorrhage while securing at the same time effective dilatation. The hemorrhage being arrested, assistance must be procured and the uterine contents evacuated. In this condition we find probably what has been regarded as the most urgent indication for the performance of *accouchement forcé*—that is, the rapid manual dilatation, often accompanied with tearing, of the os uteri. This process includes the three operations of dilatation of the cervix, version, and immediate extraction of the child. It is a dangerous procedure, accompanied by a high maternal mortality, and is deservedly falling into disrepute. It has been largely supplanted by other methods of rapid dilatation not so destructive to the uterine tissues, and hence less menacing to maternal life, although more perilous to fetal existence. Among these may be mentioned *Wyder's method*, which comprises the following steps: (1) Complete anesthetization (etherization) of the patient, who rests in the lithotomy position at the side of the bed, her feet supported by two assistants and the operator sitting directly in front; (2) removal of the tampon (hemorrhage now usually recommences very profusely) and rapid dilatation of the os with Hegar's dilators, Barnes' bags, or the fingers to an extent sufficient to admit one or two fingers; (3) displacement of the placenta (if incomplete placenta prævia) or perforation (if complete—*Rigby's method*), and rupture of the membranes; (4) introduction of the hand into the uterine cavity, and the performance of podalic or bipolar version (Braxton Hicks'

method). Generally the right hand is introduced, since it usually corresponds to the most accessible margin of the placenta, the smallest segment of which lies, as a rule, to the left side of the uterus. The fetal leg should be dragged down until the knee appears at the vulva, by which time the breech will have well engaged in the superior strait, and by its bulk and the pressure it exerts as a wedge-shaped plug with the base above, bleeding will be completely controlled. There is now no longer any danger of fatal hemorrhage, and the patient may be allowed to deliver herself as in an ordinary breech presentation. The anesthetic may be removed, the patient replaced in bed, and labor allowed to proceed. In certain cases, as when maternal or fetal life is threatened from any additional cause, or when it seems desirable to quickly terminate the labor, the traction may be continued and the fetus delivered rapidly. A very effective method of performing rapid digital dilatation of the os uteri (Plates 2, 3) has recently been suggested by Dr. Philander A. Harris of Paterson, N. J.[1] The patient being anesthetized, the index finger is inserted to its largest diameter through the os; the finger is then withdrawn so that its tip merely enters the os, and the tip of the thumb is introduced beside it. When the tips of both index finger and thumb are thus within the os, and the second finger sharply flexed, with the os resting on its palmar and inner laterodorsal aspect, the index and second fingers must be kept close together to form a notch from which the cervical ring cannot readily escape. This is the *first position* of the dilatation. The straightened and extended thumb, resting on the outer lateral side of the index finger, is now carried as far from the tip of the index finger as the enlargement of the os will permit; the index and second fingers are slightly extended, and the second finger is introduced beside the index finger and thumb. This is the *second position* of the dilatation. The power for stretching is derived from fixation of the thumb on the first

[1] *Am. Jour. of Obs.*, Jan., 1894.

Method of performing rapid manual dilatation of the os uteri: 1, position of fingers in the beginning of manual or digital dilatation of the cervix uteri—first position; 2, limit of dilatation in first position; 3, second position; 4, limit of dilatation in second position; 5, third position. (From photographs by Dr. Philander A. Harris of Paterson, N. J.)

Method of performing rapid manual dilatation of the os uteri: 1, limit of dilatation in third position; 2, fourth position; 3, limit of dilatation in fourth position; 4, fifth position; 5, sixth position. (From photographs by Dr. Philander A. Harris of Paterson, N. J.)

finger, while counter-pressure is effected by flexing the index, second, and third fingers in the manner described for the first position. In a short time the third finger may be introduced, and this constitutes the *third position*. The os, still hooked over the tip of the extended thumb, will now have its point of counter-pressure between the third finger and the inner laterodorsal aspect of the fourth finger. Tonic flexion of all the fingers is again resorted to, and soon all the fingers, together with the thumb, may be introduced, thus forming the *fourth position*. The limit of dilatation in this position for a hand measuring 19¾ cm. (7.775575 in.) over the metacarpophalangeal articulation (as measured for gloves) is 21½ cm. (8.46455 in.), circumferential measurement. In the *fifth position* the cervix is made to encircle the first row of phalangeal bones of the fingers and the second or last phalanx of the thumb. The movement required in this position is extension of the thumb and all the fingers, the tips of the fingers being at the same time flexed to lessen their encroachment on the intrauterine space. A less fatiguing and somewhat more powerful dilating manipulation is the *sixth* and *last position*, which is effected by causing the cervix to encircle the second row of phalangeal bones of the fingers and the first phalanx of the thumb. Harris has employed this method in a number of instances with excellent success, and recommends it in all cases in which the os is dilatable.

Other Methods of Treatment.—Various other methods of treatment, the primary object of which is the arrest of hemorrhage irrespective of the safety of fetal life, have been suggested. Prominent among these are the following: (1) *Barnes' method*, a modification of the old Simpson method. It consists in separation of the placenta from the lower uterine segment, accomplished, after the cervix has been softened by the tampon, by introducing the hand into the vagina and the index finger through the internal os; the finger is then swept around and the placenta separated as

far as the contraction-ring of Bandl, probably to the extent of from 10 to 11½ cm. (3.9370 to 4.52755 in.). After the performance of this maneuver the tissues of the lower uterine segment retract and hemorrhage is controlled, and at the same time dilatation of the cervix facilitated; version is then performed as before, and the breech made to engage. The objection to this method is the extremely high fetal mortality; indeed, it is rare for the child to survive the asphyxiation produced by the abolishment of the function of so large a portion of the placenta. (2) *Wiegand's method*, which consists in tamponade of the vagina followed by spontaneous delivery of the child. The combined pressure exerted below by the vaginal tampon and above by the advancing fetal presentation controls the hemorrhage. Fetal life is always jeopardized by this procedure, and even lost in the vast majority of the cases. (3) *Simpson's method*, which is impracticable, and therefore rapidly becoming, if not already, obsolete. It consisted in complete separation of the placenta, followed by its extraction before the delivery of the child. Such a procedure necessarily sacrificed fetal life, and the method was recommended by Simpson mainly for those cases in which fetal death was already assured or where evacuation of the uterine contents was indicated before fetal viability. (4) *Kristeller's method of expression*, a valuable method in those cases of partial placenta prævia in which hemorrhage is slight and the head is presenting. It consists in pressure from above through the abdominal walls upon the fetal ellipse, or directly upon the fetal head to secure speedy engagement of that presentation, and in this way, by exerting direct mechanical compression upon the lacerated uterine sinuses, to secure an arrest of the hemorrhage. This method is not applicable to those cases in which the hemorrhage is very profuse or the cervix rigid, rendering speedy engagement impossible.

After-treatment of Placenta Prævia.—The tendency to postpartum hemorrhage renders it incumbent upon the

physician to see that perfect uterine contraction be assured. One or two full doses of ergot by the mouth or hypodermically should be given during the process of delivery, and small doses administered three or four times daily for the subsequent four or five days. A uterine pad and firmly-applied abdominal binder will supplement the action of the drug. In case there has been excessive loss of blood the patient will present the symptoms of acute anemia, and in order to avoid a fatal syncope prompt treatment is necessary. *Autotransfusion*, the transfer of the blood of the body to the brain and other central organs, may be accomplished by depressing the patient's head, elevating the hips, and tightly bandaging the extremities; bottles of hot water should be applied to the feet and the calves of the legs. Immediate or mediate transfusion may be practised, the well-known apparatus of Aveling (a small valveless ball-syringe with a silver cannula at either end) being used for the purpose; or, better still, the veins may be filled by injecting directly, hypodermically or *per rectum*, from ½ to 3 pints of normal salt-solution (a solution containing six-tenths of 1 per cent. of sodium chlorid, or about 3 grains of the salt to the ounce of warm sterilized water). If this be administered hypodermically, a favorite position for the injection is at some point posteriorly, as between the margins of the scapulæ or into the buttocks. Little's solution at blood-heat is also frequently employed. It consists of a mixture of sodium chlorid, ʒj; potassium chlorid, gr. vj; sodium phosphate, gr. iij; sodium carbonate, gr. xx; and water, fʒxx. From 10 to 12 ounces of this are slowly injected intravenously, preferably into the arm. Intravenous transfusion may be accomplished by placing the salt-solution or the defibrinated blood, if it be employed, in a sterilized glass funnel to which is attached a portion of sterilized rubber-tubing and a small glass cannula. Further stimulation of the patient may be accomplished by the administration of hypodermic injections

of strychnin sulphate, grain $\frac{1}{20}$; fluid extract of digitalis, minim i–x; trinitrin, grain $\frac{1}{100}$ to $\frac{1}{50}$; and morphin sulphate, grain $\frac{1}{8}$ to $\frac{1}{6}$. In the course of from four to six hours nutrient rectal enemata may be given. Should the child be premature and feeble, it will be necessary to resort to the use of a couveuse and to feeding by gavage.

2. *Premature Detachment of the Placenta* (*Accidental Hemorrhage*).—The term *accidental hemorrhage* is used to indicate that serious variety of gestatory hemorrhage consequent upon a premature partial separation of a placenta that is normally situated in the upper uterine segment. This, like the preceding, is a rare complication of pregnancy, statistics showing that it is likely to be encountered but once in from 7000 to 10,000 cases. It is commonly noted during the first stage of labor, but may occur at any time during the last three months of pregnancy. *Varieties.*—The hemorrhage may manifest itself in one of two ways: it may be, as usual, open or frank, or more rarely it may be obscure or concealed; in the former case placental separation frequently occurs at the lower margin, and there is a free escape of blood from the genital tract, the hemorrhage finding its way between the chorion and deciduæ; while in the latter case there are present all the symptoms of a profuse hemorrhage without the escape of any blood from the genitalia. According to the classical paper of Goodell,[1] this concealment of the hemorrhage may occur from one of the following causes: (1) The separation may take place at the center of the placenta, the margins still being adherent; in such a case the hemorrhage would be limited, a large retroplacental clot forming. (2) The placenta may become detached at its upper margin only, and permit an escape of blood between the membranes and the uterine wall; here also, though not to the same extent, there would be a certain limit to the amount of blood extravasated. (3) The detachment may take place as before at the upper margin, but,

[1] *Am. Jour. of Obstetrics*, August, 1869, p. 281.

owing to the pressure exerted by the effused blood upon the delicate membranes, the latter rupture and permit an escape of the blood into the amniotic sac, where it commingles with the liquor amnii; this is rare. (4) The membranes may have already ruptured, and detachment of the placenta occurring at any point, usually the upper margin, the effused blood is prevented from escaping by a blocking up of the parturient canal by the presenting part of the fetus, by some of the fetal appendages (the membranes), or by a large blood-clot. *Etiology*.—While the causation of this accident is not patent in every instance, there are certain predisposing and exciting causes that may be noted. Among the former are to be mentioned multiparity; the loose attachment of the placenta normally noted during the later weeks of pregnancy, and consequent upon the fatty changes that take place at that time; preexisting renal disease, which predisposes to apoplexies of the deciduæ and placenta;[1] various forms of placental disease; pronounced anemia; extreme pelvic congestion; impairment of the general health; and, rarely, prolongation of pregnancy. The *exciting cause* may be any form of traumatism, as a blow, kick, or fall, any violent muscular effort on the part of the patient herself, profound emotion or anything inducing strong and irregular uterine contractions, as some acute diseases (scarlet, typhus, or typhoid fever, small-pox). It is possible, however, for separation to occur while the patient is absolutely at rest or even during sleep. *Symptoms*.—In the frank variety the sudden gush of blood, occurring, as a rule, during the first stage of labor, and not associated with a low position of the placenta, constitutes about the only symptom of the condition. There is usually pain of some severity, at times persistent, and of a tearing, lancinating character, confined to the region of the placenta, although

[1] O. von Weiss (*Archiv f. Gynäk.*, Bd. 46, H. 2, 1893) thinks it probable that it is owing to exudation and degenerative changes of the decidua dependent on renal affection that premature detachment can take place.

this symptom may be absent. Occasionally the hemorrhage may occur as a more or less constant dribbling, part escaping from the genital tract, while the remainder undergoes coagulation; this may continue for some weeks, in the aggregate a vast amount of blood escaping from the genital canal, and a large clot forming at the point of placental separation. The *concealed* variety is characterized by the symptoms of shock and internal hemorrhage; there is extreme pallor of the face and general surface, which are covered with small beads of perspiration; the extremities are cold, moist, and clammy; the pulse is rapid, small, and compressible; "air-hunger" is present, while more or less dyspnea may be noted; the patient complains of thirst, nausea, impairment of vision, ringing in the ears; there is jactitation, and, finally, coma and death. *Physical Signs.*—In the *frank* variety a physical exploration of the patient will reveal, in addition to the profuse hemorrhage, a normal condition of the cervix and no increase in the size of the uterus; that organ, however, will be found to be more or less relaxed, flabby, and atonic, and but feebly responding to the labor-contractions. The physical signs are more characteristic when the hemorrhage is concealed. Abdominal palpation then reveals a rapidly enlarging uterus, toward the fundus of which may be detected a slight amount of contraction, with sometimes a lateral bulging of the uterine walls, while there is experienced an increasing difficulty in recognizing the fetal parts; in the rarer cases in which the hemorrhage is entirely retroplacental there may be detected a localized tumor upon that side of the uterus, the remaining portion of the organ being more or less firmly contracted. *Diagnosis.*—There are but two conditions that may have to be differentiated from placental separation: these are placenta prævia and rupture of the uterus, both of which may be characterized by profuse hemorrhage, but which otherwise should be clinically distinct. The following points of differentiation must be borne in mind:

From *placenta prævia*:

Premature Detachment.	*Placenta Prævia.*
Most commonly occurs during the first stage of labor, but may occur at any time during the last three months of pregnancy.	Most commonly manifests itself after the sixth month of gestation, but may occur as early as the second month.
The hemorrhage is sudden, and generally is attended with sharp pain.	The hemorrhage is abrupt but painless.
Hemorrhage persists until the uterine contents are evacuated or the patient perishes.	There are generally repeated hemorrhages of increasing severity.
Vaginal examination reveals no deviation from the condition normal to pregnancy.	There is an edematous condition of the cervix and lower uterine segment, with marked pulsation.
The cervix is perhaps (if labor be initiated) slightly patulous.	Cervix is generally quite patulous, and within may be detected the placenta.
The placental bruit is in normal position.	The placental bruit is situated low down.

From *rupture of the uterus*:

Premature Detachment.	*Rupture of the Uterus.*
Usually occurs early in labor or during the late months of pregnancy.	Usually occurs late in a protracted and difficult labor.
The membranes are generally not ruptured.	The membranes are always ruptured.
The presenting part maintains its original position or slightly protrudes.	Unless tightly engaged the presenting part recedes.
The uterus is large, soft, flabby, and shows but slight contraction near the fundus.	The upper uterine segment is contracted; the lower segment is distended.
The uterine tumor is increased in size.	The uterine tumor is decreased in size.
No additional tumors are to be recognized.	In case of escape of the fetus from the uterine cavity an additional abdominal tumor will be discovered.
There exists no obstruction to labor.	There is some insuperable obstruction to labor.
There is no subcutaneous emphysema.	There is often a subcutaneous emphysema.

Prognosis.—When the hemorrhage is open the prognosis for the mother is good; prompt interference with hasty termination of pregnancy will arrest the bleeding and save the patient's life. In the case of concealed hemorrhage, usually so great is the delay in arriving at a diagnosis of the condition that the mother will frequently perish almost before the gravity of her condition is recognized; fully 50 per cent. of these women die. The dangers to be anticipated in the rare forms in which there is persistent dribbling of blood for a period of some weeks, with the formation of immense coagula between the placenta and the uterine wall, are pernicious anemia from the excessive loss of blood, and sepsis from putrefaction and breaking

down of the coagula. In all cases the fetal mortality is high; fully 90 per cent. or more of the children perish. The *causes of fetal death* are prematurity, asphyxiation from loss of placental function, and hemorrhage. The *causes of maternal death* are hemorrhage, sepsis, shock from over-distention of the uterus or following manipulative efforts at treatment, or postpartum hemorrhage, to which, as in the case of placenta prævia, there appears to be a special tendency. The *treatment* must always and only be active interference with rapid termination of pregnancy. Ten minutes are all that can be allowed to secure evacuation of the uterine contents. The steps of the treatment are as follows: 1. The hypodermic injection of ergotin; 2. Rapid dilatation of the cervix by means of the fingers, as in Harris' method, or by Barnes' bags; 3. Perforation of the membranes so as to permit of uterine contraction following escape of the liquor amnii, which may or may not be blood-stained according as to whether or not the membranes have yielded above; generally it is untinged with blood; 4. Delivery of the child by podalic version when the head has not already engaged; if the head be engaged, the forceps should be applied and the child delivered as rapidly as possible. If the child be dead already or non-viable, or if the fetal head be large or the maternal pelvis undersized and the excessive hemorrhage jeopardize maternal life, craniotomy must be performed. In cases in which the hemorrhage has been excessive and the patient's life is in imminent danger, the advisability of performing a Porro-Cesarean operation should be taken into consideration; 5. The application of a uterine pad and firm abdominal binder. The *after-treatment* consists in efforts at the prevention of postpartum hemorrhage, and in those cases in which a considerable amount of blood has been lost the treatment of the subsequent acute anemia in the manner already described. Thirst may be alleviated by teaspoonful doses of barley-water, fragments of cracked ice in the mouth, or sips of a

weak saline drink, as a very dilute solution of ammonium acetate.

(*c*) Hemorrhage from the Genitalia not the Result of Placental Anomalies.—In addition to the rare hemorrhages from the genital passages of the pregnant woman just enumerated, there are other conditions that may cause bleeding of varying degrees of severity from this locality during the different stages of gestation. Most important among these hemorrhages may be mentioned that indicative of a threatened abortion, and which is due to a partial detachment of the fetal membranes before the formation of the placenta. Certain diseases of the membranes and placenta, as congestion and apoplexy of these organs, may also result in a discharge of blood from the vagina, and may likewise end in a true abortion. Various cervical conditions, as a preexisting cervical endometritis with granular erosion of the lips, carcinoma, or the presence of an intracervical mucous polyp, will occasionally give rise to hemorrhage. In the case of the polyp the bleeding steadily increases in amount as the tumor gains in bulk, and may eventually become excessive. Carcinoma is rare, and is only accompanied by bleeding when there is a direct mechanical irritation of the diseased tissue, as in coitus. The hemorrhoidal condition peculiar to many cases of pregnancy may involve the vessels of the vaginal walls to a considerable extent; rupture of one of these dilated vessels can very readily occur and venous hemorrhage follow. In very rare instances there may be a carcinomatous involvement of the vaginal tissues, either primary or, more generally, secondary to cervical disease; coitus or any rough manipulation during a vaginal examination may detach a portion of the friable tissue and hemorrhage will follow. Finally, in some cases there may be a regular periodic discharge of blood throughout the gestation, occurring at the usual menstrual epochs, and partaking in every respect of the nature of the ordinary menstrual flux. These

cases of so-called persistence of menstruation, while rare, do undoubtedly exist, and the possibility of their occurrence must be borne in mind in the management of the minor forms of gestational hemorrhage. *Treatment.*—Should the bleeding be recognized as a continuance of the menstruation, treatment is contraindicated. In all other cases cautious vaginal tamponade with the occasional employment of local astringents, as tannic acid or Monsel's solution, will probably answer.

(9) **Affections of the Thyroid Gland.**—The thyroid gland exhibits a peculiar relationship with the general circulation and with the genitourinary system, the nature of which is not fully recognized. It is a well-known fact that, as in the case of the mammæ, anything that will result in an enlargement of the uterus will give rise to a corresponding increase in the size of the thyroid gland. It is due to this sympathetic growth of the gland that the throats of married women assume their characteristic pyramidal shape. The existence of this reflex relationship between the gland and the genitalia being granted, it may readily be conceived that pathologic conditions of the gland might be influenced very perceptibly by the existence of pregnancy, and *vice versâ;* clinically, this has been found to be the case. In the two conditions in which there exists already an hypertrophy of the glandular substance—namely, simple and exophthalmic goiter—pregnancy exerts a very unfavorable influence. The enlarged organ undergoes rapid growth, and may so impinge upon the trachea as to produce a certain amount of dyspnea, and even threaten maternal death from asphyxia. The gland becomes large, soft, and pulsating; the symptoms of the preexisting disease become aggravated, and the patient rapidly develops a condition of at least marked discomfort, if not of absolute danger. The effect produced by the disease upon the physiologic condition is likewise unfavorable. The tendency is to abortion from apoplexy of the fetal structures, and fetal

death. Under such a combination of circumstances the closest watch must be maintained over the patient's condition, and upon any sign of grave maternal danger the pregnancy must be brought to an end. Tracheotomy may have to be performed in order to save the patient's life. After the termination of pregnancy the enlarged gland will again diminish in size to a certain extent, but seldom will it return to its original proportions.

5. Diseases of the Genitourinary Tract.

(1) **Affections of the Kidneys.**—(*a*) *Nephritis.*—True nephritis complicating pregnancy constitutes an exceedingly serious condition; indeed, some authorities (Tyson *et al.*) go so far as to say that pregnancy occurring in a woman already the subject of chronic nephritis will invariably terminate fatally from puerperal eclampsia if the gestation be not prematurely brought to a close. The renal disease may appear in the acute form at any time during the progress of pregnancy, and it will manifest itself then in the ordinary manner; the symptoms, however, will all be aggravated, and the disease will speedily terminate fatally in a large proportion of the cases. The *symptoms* are the same as in the uncomplicated disease. *Diagnosis.*—There will be no difficulty in diagnosticating an attack of acute nephritis occurring during gestation. The onset is abrupt, and generally follows a known cause; edema appears almost from the beginning. The urine at first is much increased in amount, and later is greatly diminished; an examination of it will reveal the presence of free blood together with blood-casts and hyaline casts. An ophthalmoscopic examination will show in advanced cases more or less albuminuric retinitis that will be manifested by a certain amount of impairment of vision. More trouble will be experienced in differentiating simple renal congestion from a true inflammatory condition of that organ. The points to be elicited in making this diagnosis will be pre-

sented in the consideration of the former affection. The *prognosis* is grave in every sense of the word. The maternal mortality is very high; as stated above, the affection is by many regarded as fatal if the pregnancy be allowed to continue. Another source of danger is the great tendency to septicemia that is manifested by all nephritic patients after the uterus has been emptied. The fetal mortality is absolute, the causes of fetal death being abortion, prematurity, and asphyxiation from placental apoplexy. The *treatment* is essentially the same as for renal congestion, and will be considered under that disease.

(*b*) *Renal Insufficiency* (*the Kidney of Pregnancy; the Albuminuria of Pregnancy; Puerperal Albuminuria; Puerperal Nephritis; Rayer's Disease*).—Under these various headings has been treated by different writers that very important and peculiar condition manifested by a certain proportion of pregnant women which is characterized by the appearance in the urine of albumin in varying amounts, but which is unassociated with any grave organic change in the kidneys. *Etiology*.—When inquiry is made into the causation of the condition, and it is endeavored to ascertain just why a certain proportion—about 6 per cent.—of pregnant women have albumin in their urine, while the remaining 94 per cent. do not, any adequate solution of the problem cannot be offered. The condition is eminently an obscure one. True, the immediate cause of the albuminuria is patent: it results from a renal insufficiency, owing to which the proper elimination of the effete material of the blood is not effected, and the nutritious elements are allowed to escape along with the waste. Just what it is that produces this imperfect action of the renal cells and that induces in them a process of fatty infiltration, so that they present an anemic appearance, is not positively known. Various ingenious theories have been advanced. Gubler's theory was that of *superalbuminosis*, an excessive amount of albumin in the blood that could only be dis-

posed of by elimination through the agency of the kidneys. The theory of renal congestion is not substantiated by the appearance of these organs in this condition: they are markedly anemic, and do not present the distended condition of the vessels that has been suggested by some as probably existing. Other possible causes that have been offered to account for this renal anemia are the pressure exerted upon the renal vessels by the gravid uterus, excessive hydremia resulting in a high arterial tension, and the effects of weather and climate. The general opinion now is that the anemia arises from a tonic contraction of the renal arteries, due to the presence in the blood of a large amount of effete matter derived mainly from the fetal circulation, thus producing a diminished supply of blood to the kidneys. In connection with this condition there is probably a certain amount of interference with the renal circulation due to the increase in the abdominal pressure consequent upon the large size of the gravid uterus, but this is in its effects subordinate to the preceding. Primiparity seems to exert some influence upon the production of renal inadequacy, for it occurs with far greater frequency during the first than in subsequent gestations. *Symptoms.*—The main clinical manifestation of this condition is the presence of albumin in the urine, and generally this will not be discovered until about the sixth month of gestation. It may be that long before this the patient will suffer from headaches and obscure pains in the lumbar region, with some dulness of cerebration and a varying degree of anemia. Microscopic examination of the urine may reveal a number of hyaline and granular casts, or these may be entirely absent. There is an increased action of the heart and a rise in the arterial tension, with a full, bounding, incompressible pulse. As the disease advances edema of the face and extremities may appear; the quantity of albumin in the urine will increase to 1 per cent. or more; the cephalalgia and other nervous

manifestations will grow more pronounced; the urinary casts will increase in number; epistaxis, ringing in the ears, vertigo, visual disturbance, and nausea and vomiting may appear, and the patient develop an apoplexy or a sudden eclamptic seizure. A peculiar feature of this renal inadequacy is its tendency to reappear in subsequent pregnancies, although there may have been a perfect recovery from the condition after the termination of the previous labor. In exceptional cases there may be a complete absence of albumin from the urine until labor has well progressed, when there will suddenly appear a large quantity ushering in the onset of a severe attack of eclampsia. In other cases there may be an intermittent albuminuria during the latter months of gestation. *Diagnosis.*—The one condition from which renal inadequacy must be differentiated is the true form of chronic nephritis. Some difficulty may be experienced in accomplishing this, but the following table will reveal the main points of diagnosis:

Renal Inadequacy.	*Chronic Nephritis.*
As a rule, this will not manifest itself until the sixth month of pregnancy.	The chronic disease has probably existed prior to conception.
Grave symptoms occur only in the latter months of pregnancy.	The grave symptoms manifest themselves early in pregnancy.
There is generally an absence of casts; in very grave and advanced cases hyaline and granular casts may be present.	Casts are present from the onset of the grave symptoms, and generally, though not invariably, in large number.
Ophthalmoscopic examination is negative.	There is present an albuminuric retinitis.
The condition ceases with the termination of labor.	The disease persists after the emptying of the uterus.
No grave organic lesions of the kidneys are present after death, should this occur.	The kidneys show marked organic alterations on postmortem examination.

Prognosis.—The prognosis is always anxious on account of the possible complications that may occur. The effect upon the general health and upon the course of the pregnancy may be very disastrous, and, should the condition show itself resistant to treatment and grow steadily worse despite the remedial measures adopted, the only course left is the induction of premature labor. The dangers are the development of a true nephritis, cerebral apoplexy, and puer-

peral eclampsia. The fetal prognosis is very grave; in a large proportion of the cases the fetus will perish from the development of placental apoplexy (the so-called white infarctions), from prematurity, or from the manipulations consequent upon a premature termination of pregnancy. *Treatment.*—The *prophylactic treatment* of renal inadequacy consists, in the first place, in a careful supervision of the condition of the urine. Frequent testings for albumin should be made, and if it be discovered the patient must be placed at once upon an appropriate dietetic, hygienic, and therapeutic regimen. Suitable clothing and a proper amount of exercise must be insisted upon. If it can be borne, a rigid milk-diet should be given, or, this failing, a light and restricted diet, excluding meats and heavy vegetables, must be recommended, and this should be supplemented by a proper course of diuretics, laxatives, and alteratives. Large draughts of Poland or lithia water, a mixture of sodium benzoate (5 or 10 grains with 1 dram of sugar of milk dissolved in water), 2- or 3-grain doses of caffein citrate, ½ ounce of Basham's mixture three times daily, or suitable doses of Hunyadi water, will exert a valuable action on the kidneys and increase the amount of urine voided. Moderate doses of magnesium sulphate or citrate, compound licorice-powder, compound jalap-powder, or other mild laxative will aid in eliminating some of the effete material in the blood. The bromids and chloral hydrate in full doses will aid in allaying nervous manifestations. In the acute cases of albuminuria associated with a full, bounding pulse venesection to the extent of from 10 to 15 ounces may prove beneficial. Should the condition steadily increase in gravity and an alarming proportion of albumin—from 10 to 12 per cent.—appear in the urine, the induction of premature labor in the manner already given will be indicated in order to save maternal life.

(*c*) *Puerperal Eclampsia.*—*Synonyms.*—Puerperal convulsions, eclampsia gravidarum, eclampsia puerperarum, eclamp-

sia parturientium, ptomainemia. *Definition.* — Puerperal eclampsia is a convulsive or epileptiform seizure appearing suddenly in a woman prior to or during labor, or more rarely in the puerperal state, and characterized by tonic, and later by clonic, convulsions of the muscles, with albuminuria, unconsciousness, and death. *Frequency.* — Although this serious disease occurs with the greatest frequency during the progress of labor, still, owing to the intimate relationship that it bears to the subject just under consideration, and to the fact that it is by no means an infrequent complication of pregnancy itself, it has been deemed best to consider it at this place. Puerperal eclampsia is encountered about once in from 350 to 500 cases, and it is stated that in a little over 1 per cent. of the cases of albuminuria of pregnancy eclampsia will follow. *Etiology.*— There are various predisposing causes of this affection, among which may be mentioned: (1) *Primiparity*, the great majority of cases occurring in the first pregnancy. The probable explanation of this preponderance of the affection in primigravidæ is the occurrence in them of conditions that, as a rule, are not present in multiparæ—namely, certain malpositions of the uterus exerting undue pressure upon the vessels in the lumbar region, and thus interfering with the renal circulation; excessive coitus; improper and tightly-fitting clothing, including tight-lacing; and a rigid condition of the abdominal walls. (2) *Heredity*, an inherited tendency to kidney-disease existing in many individuals, in whom the additional strain consequent upon pregnancy will suffice to precipitate an acute attack of renal insufficiency. (3) *Climatic influence*, another proof of the relationship of this affection to kidney-insufficiency, both affections being more common during the fall of the year and in countries in which the climate is damp. (4) *Multiple pregnancy*, under such circumstances there being an excessive amount of excrementitious matter in the blood requiring elimination. (5) *Extreme anæmia* dependent upon pregnancy or some

other cause. (6) *Nervous excitability*, which is very likely to be present in primiparæ and in those who are suffering from some form of dystocia. While it is true that under the foregoing conditions the disease is more prone to manifest itself, but little light is thrown by them upon the *direct cause* of the convulsive seizures. Various theories have been advanced to explain the production of the convulsions. *Lever's theory* — the *pressure* or *mechanical* theory—was that of the existence of an uremia (as in the ordinary eclamptic seizures of an acute or chronic nephritis) dependent upon the pressure exerted by the gravid uterus upon the renal vessels. It has been clearly demonstrated, however, that urea as such does not exist in the blood in this affection. Undoubtedly, in a large proportion of the cases the albuminuria results from mechanical pressure; hence may be explained the greater frequency of the disease in primiparæ, in whom exists more or less rigidity of the abdominal walls, increasing the intraabdominal pressure and thus indirectly interfering with the renal circulation. Kedarnath Das[1] has also suggested that the increased intraabdominal pressure might readily result in an outward displacement of the kidneys, thereby resulting in an elongation of the renal vessels with consequent diminution in their caliber and obstruction to the flow of blood. *Halbertsma's theory* is a modification of the pressure-theory. He attributes the condition to a compression of the ureters by the gravid uterus. While it may be possible for such a cause to act, it must be of exceedingly rare occurrence. *Tyler Smith's theory* was that the albuminuria was a direct outcome of a sympathetic irritation of the kidneys—one of the reflex phenomena of gestation—and not merely the result of a mechanical pressure exerted by the gravid uterus; this view is based upon the direct connection existing between the uterine and renal nerve-plexuses. *Gubler's theory* was that of a *superalbuminosis*, or overproduction

[1] *Prov. Med. Jour.*, Feb. 1, 1895.

of albumin, the excess of which was eliminated by means of the renal function. This is very analogous to *Peters' theory* of transudation of albumin without necessarily overproduction thereof. As might be expected, there has been suggested a *specific theory*, that of *Blanc* of Lyons, who claims to have discovered in the urine a special form of bacillus which is the cause of the eclampsia; later investigators have disproved the existence of such a germ. Finally, closely allied are the fetal theory of the Germans and the views adopted by Barnes, Spiegelberg, Frerichs, Traube, and Rosenstein. These theories, all based upon the presence in the blood of some noxious element that is directly responsible for the eclamptic seizures, while not now accepted in their entirety, are the immediate forerunners of the generally accepted theory. Thus, Frerichs suggested that the condition was one of ammonemia—that is, the existence in the blood of large amounts of ammonium carbonate resulting from a decomposition of the urea circulating therein. This theory was likewise shown to be false by experiments in which the blood was supercharged with ammonium carbonate without the development of convulsive seizures. The *fetal theory* attributes the entire trouble to previous disease or death of the fetus. There can be no doubt that the relationship existing between mother and fetus is an intimate one, but it is not probable that pathologic processes in the fetus irrespective of changes in the maternal organism can be productive of such a grave condition as the eclampsia of pregnancy. *Barnes' theory* was that the disease was of complex origin, including extreme hydremia with corresponding malnutrition of the nerve-centers, increased nervous tension and irritability, increased vascular tension, and a certain degree of toxemia from inaction of the kidneys and other emunctories. *Spiegelberg's theory* of *vasomotor spasm* the result of renal inadequacy of acute origin, arising from reflex irritation of the uterine nerves, is but a variation of the others in this group.

The theory advanced by *Traube* and *Rosenstein*, while not correct, was a step in advance, and led the way to the adoption of the accepted theory: it claimed that the convulsions were a direct result of a cerebral anemia with more or less serous effusion into the tissues of the brain, the condition being an immediate outcome of the hydremia of pregnancy. From the fact that the disease is prevalent in countries, climates, and seasons in which there is a preponderance of renal troubles, and because of the intimate relationship that has now been definitely proved to exist between a puerperal eclamptic seizure and an insufficient action of the kidneys, it is at present generally conceded by obstetric authorities who have conscientiously studied the foregoing views that the direct cause of puerperal eclampsia is the presence in the blood of an excessive amount of effete matter, probably kreatin and kreatinin, derived from both mother and child, but largely from the latter, and which, failing to be eliminated by the kidneys, induces a general vasomotor contraction of the arterioles of the body, affecting as well those of the base of the brain. As a result of this contraction the deeper portions of the brain experience a sudden acute anemia, while the blood is driven violently to the more superficial portions, which become correspondingly intensely engorged; the irritation of the cells of the brain-cortex resulting from this excessive supply of blood terminates in the development of eclamptic seizures. There is likewise produced a vasomotor anemia of the kidneys due directly to a reflex irritation of the sympathetic plexuses of the pelvis. Any acute condition radically increasing the amount of effete material in the blood, and thereby causing a sudden rise in the arterial pressure, will, in an individual presenting any or all of these predisposing causes, precipitate an attack of eclampsia. Among these *exciting causes* of eclampsia may be mentioned the following: (1) The development of an acute nephritis or of an acute attack of renal insufficiency; (2)

sudden pressure by the gravid uterus upon the kidneys or their excretory ducts, or upon the abdominal aorta and inferior vena cava and their large branches; (3) *profound emotion*, as during the pains of labor. *Clinical Manifestations.*—Preceding the true convulsive seizure there are generally to be noted some *premonitory* or *prodromal symptoms* that to an experienced eye will serve as ample warning of the impending attack. As in an epileptic seizure, a distinct aura may initiate the paroxysm in some of the cases; in others there will be present one or more of the following symptoms: Severe headache, vertigo, muscæ volitantes, dimness of vision, pupillary contraction, amblyopia, pain in the epigastrium or under the left clavicle, violent rolling of the head, tinnitus aurium, more or less uncontrollable vomiting, and generally albuminuria and a slight amount of edema (in about 84 per cent. of the cases); there may be noted at this time a certain amount of stupor. These prodromal symptoms persisting for a few minutes, the convulsion itself appears with lightning-like rapidity. The eyes suddenly become fixed; the lids twitch convulsively; the pupillary contraction becomes primarily more pronounced, but is ultimately followed by complete dilatation; the eyeballs are rolled quickly from side to side, and a tonic contraction of the facial muscles appears, inducing extreme distortion of the face; the angles of the mouth are contracted into the so-called *sardonic* grin; the head is violently tossed from side to side or is drawn strongly backward by contraction of the dorsal muscles of the neck; the pallor that has up to this time persisted is now replaced by a marked lividity or even by complete cyanosis due to interference with the respiration from tonic contraction of the respiratory muscles. During the height of the paroxysm there may be one or two spasmodic respirations, although the chest-muscles are tightly contracted. The muscular spasm rapidly spreads downward until the trunk is involved, resulting in varying degrees of

opisthotonos or pleurosthotonos, and the thighs are strongly flexed upon the abdomen; it is rare, however, to find an involvement of the muscles of the leg below the knee. The pulse is full, slow, and bounding, but may reach 100 to 140 beats per minute, and the veins of the neck are immensely distended. The temperature shows but a slight degree of elevation, but this rise steadily increases with each paroxysm, until it reaches 104° or 105° F.; occasionally subnormal temperatures may be noted. As the spasm begins to decline the tonic is replaced by clonic contraction of the muscles; the hands are spasmodically opened and closed, and the limbs are thrown about. Respiration is slowly reestablished, although it is jerky, stertorous, and irregular at first; the tongue is protruded, and may be severely injured by spasmodic action of the muscles of the jaw; bloody froth is expelled from between the teeth and lips and from the nostrils, and a profuse perspiration breaks out over the surface of the body. Owing to relaxation of the exhausted sphincters of the body there may be an involuntary escape of feces and urine; the pupils again contract; consciousness, which has been completely lost during the convulsion, is partially restored, although there is usually manifested a tendency to coma for a period of from a half to one hour after the subsidence of the spasm. The *duration* of a paroxysm varies from one-half to two minutes; its intensity likewise varies: it may be slight, but usually is severe, and upon the severity will depend the degree of subsequent coma. The *interval* between the successive paroxysms may be but a few minutes or it may last for several hours; in some cases the paroxysms may follow in quick succession; thus, in a recorded instance 160 convulsions were noted in twenty-four hours. With each successive paroxysm there is a progressive deepening of the coma until complete unconsciousness ensue; when the paroxysms are separated by an interval of sufficient length to permit of a return to consciousness, the patient is

unable to recall what has transpired during the attack or even for some time prior to it. A curious feature to be noted in the intervals is the extreme irritability of the nerve-centers: this may become so pronounced that the slightest noise or disturbing cause will suffice to induce another paroxysm. Should the first attack of eclampsia occur during pregnancy, it is not unusual to have labor precipitated by a participation of the uterine muscles in the spasmodic action; for the same reason a precipitate expulsion of the child may follow when the attack occurs during the progress of labor. The *pathology* of the condition is obscure. In addition to the usual anemia of the central cerebral substance and congestion of its cortex there is a corresponding anemic condition of the kidneys and other organs, and a more or less liquid condition of the blood. Attention has recently been called to the existence of hepatic lesions, including slight apoplexies that have very commonly been noted in patients dying from eclamptic seizures. The toxicity of the urine is diminished, and in direct ratio to this diminution is there an increase in the toxicity of the blood. *Diagnosis.*—While a typical puerperal eclamptic attack is not likely to be mistaken for any other condition by an experienced obstetrician, there are other convulsive seizures, as those of hysteria, anemia, and general nervous irritability, that must at times be differentiated from the true eclampsia of pregnancy.

(1) From *hysteric convulsions:*

Puerperal Eclampsia.	*Hysteric Convulsions.*
The urine generally contains a large quantity of albumin.	The urine does not contain albumin.
The convulsions are severe and typical, and are limited mainly to the head, trunk, and upper extremities.	The convulsions are not violent and are atypical, involving the lower extremities as well as the trunk, head, and arms.
Consciousness is lost during the attack, with increasing stupor in the intervals.	Consciousness is not lost during the attack nor in the intervals.
The patient may have been healthy until the first convulsion, or she may have suffered from renal insufficiency.	The patient has manifested the symptoms of hysteria to a certain degree throughout the pregnancy.
There is a gradually increasing elevation of temperature.	The temperature is variable, and may be perfectly normal.

(2) From *nervous irritability:*

Puerperal Eclampsia.	*Nervous Irritability.*
The typical convulsions are present.	The convulsions are not violent, and are of very short duration.
There may be repeated convulsive attacks.	Usually there are but one or two spasms.
Consciousness is lost during and between the attacks.	Consciousness is tolerably clear between the attacks.
The systemic condition is bad.	The systemic condition is good.
Generally the seizures may be traced to a preexisting renal inadequacy.	There is always some disturbing or irritating factor that is productive of the attack.

(3) From *anemic convulsions:*

Puerperal Eclampsia.	*Anemia.*
There is the usual history of renal insufficiency with albuminuria.	The history is that of anemia from some cause.
The convulsions are typical of the disease.	The convulsions are rare and not severe.
The urine is markedly albuminous.	There is little or no albuminuria.
Loss of consciousness is complete.	Consciousness is present in the intervals.

Prognosis.—Puerperal eclampsia is a very serious affection; the maternal mortality is about 30 per cent., while fully 50 per cent. of the children will perish. The unfavorable features are early and repeated appearance of the epileptiform seizures; marked elevation of the temperature; extreme rapidity and small size of the pulse; urinary suppression; and the existence of organic changes in the kidneys. The amount of albumin in the urine does not bear any relationship to the gravity of the case. According to Tyson and others, every instance of pregnancy in women showing the symptoms of chronic nephritis will terminate fatally from puerperal eclampsia if the gestation be allowed to continue to term. It must be borne in mind that even though the woman should survive the attack, grave sequelæ may develop, as cerebral apoplexy, postpartum hemorrhage, puerperal fever, phlegmasia alba dolens, puerperal mania, deafness, pulmonary apoplexy, and permanent impairment of vision. The *causes of maternal death* are—during the attack, asphyxia from protracted interference with respiration; cerebral apoplexy; cardiac syncope; pulmonary, laryngeal, or cerebral edema; exhaustion and depression due to the presence of an ex-

cessive amount of poisonous material in the blood; and subsequently postpartum hemorrhage or puerperal sepsis. The main *cause of fetal death* is asphyxia from interference with the placental function or from an accumulation of carbon dioxid in the blood. *Treatment.*—The treatment includes prophylaxis, the treatment of the paroxysms, the treatment during the intervals, and the after-treatment. *Prophylaxis.*—The prophylactic measures must consist mainly in a careful supervision of the condition of the urine. Immediately upon the appearance therein of albumin the patient should be regarded as in a critical condition, and steps taken to arrest further progress of the disease. These measures will include the regulation of the diet and the observance of the laws of hygiene as given in the treatment of renal inadequacy. During this period the therapeutic management will consist in the administration of diaphoretics, diuretics, and cathartics. A healthy action of the skin may be secured by gentle massage aided by a hot bath once or twice weekly. The anemia may be combated by the administration of iron, in the form of Blaud's pills, or the tincture of the chlorid in full doses. The diuretics and laxatives to be employed are those already mentioned in the preceding article. Mental excitement must be carefully avoided. If, notwithstanding these efforts to arrest the condition, the patient progressively grow worse, as a *dernier ressort* the induction of premature labor by the recognized process is indicated. *Treatment of the Paroxysms.*—Worldwide experience has demonstrated the value of chloroform in controlling the severity of the attack. As soon as the spasmodic muscular action begin a towel or other form of gag must be inserted between the teeth to prevent serious laceration of the tongue. Inhalations of chloroform should then be practised, and these continued until the paroxysm abate. Unless the convulsions follow with extreme rapidity, active measures to prevent a recurrence of the attack must be instituted, the chloroform

in the mean time being at hand to arrest at the onset any further eclamptic seizure. Under no circumstance should efforts be made to control the violence of the paroxysms by physical restraint; all such attempts are ineffectual and merely aggravate the case. *Trousseau's method* of compression of the carotids may temporarily arrest the severity of the paroxysms. *Treatment during the Intervals.*—By the prompt institution of effective therapeutic and surgical measures the severity and duration of puerperal eclampsia may be materially lessened, and maternal (and possibly fetal) life preserved. These measures include efforts at elimination of the poison and the administration of drugs to control the nervous and circulatory excitability that is characteristic of the disease. For the former purpose, in suitable cases phlebotomy may be performed, and from 20 to 35 ounces of blood extracted; by this procedure a large amount of the noxious principles in the system may be directly eliminated, and if performed early, before pulmonary edema and profound blood-poisoning supervene, venesection is eminently advantageous. Another valuable eliminative measure consists in active purgation by large doses of croton oil—from 1 to 3 drops—disguised in glycerin, sweet oil, or other oily substance, and placed well back upon the tongue; if this drug be not at hand, the administration of large doses of calomel or full doses of elaterium (gr. ¼) or compound jalap-powder will answer. Efforts to dispose of the poison by means of the kidneys will invariably prove ineffectual, owing to an actual inability on the part of these organs to functionate; therefore venesection, purgation, and diaphoresis must be called upon to assume the renal action. The hot bath (110°–112° F.) or hot wet pack may be employed to promote diaphoresis; the former is of service in hospital practice; the latter is better adapted to household purposes. It is best given in the following manner: An ordinary wash-tub is placed by the patient's bed and filled with boiling water; a number

of blankets, one for each limb and one or two for the body, are soaked in this water, wrung out, and wrapped loosely around the patient, who is stripped of every article of clothing; over these are then placed a number of dry blankets and coverlets, and the patient is allowed to perspire. A precaution that must be observed is the protection of the head during this procedure; an ice-cap or cloths wrung out of ice-water must be worn continually during the sweating process in order to prevent cerebral congestion. The patient may be kept in the pack for from three to four hours, and then, without being first dried with towels, she should be well enveloped in dry clothing. *Duer's method* of producing rapid diaphoresis when other measures have failed is to pour about two ounces of alcohol upon a very hot brick; this is then wrapped in flannel and applied to the patient's feet. Hot fomentations or dry cups over the lumbar regions may be of service in milder cases. To reduce the nervous irritability of the patient chloral hydrate *per rectum* in from 30- to 60-grain doses (*Charpentier's method*) may be administered, and repeated every two or three hours as the contingency of the case demands. Potassium bromid in 30-grain doses may be similarly employed. A drug that has come into very excellent repute of late years in the management of this disease is veratrum viride. This, in order to procure the desired effect, must be given in heroic doses hypodermically; thus, of the fluid extract 15 drops may be given, or from 20 to 25 drops of the tincture. The pulse will quickly fall under these large doses, and the arterial tension likewise. It has been found that as long as the pulse-rate be maintained at or below 60 beats per minute the eclamptic seizures will not be likely to occur; if it rise above this limit, an additional hypodermic dose of 5 minims of the drug will suffice to keep it approximately at this rate. Fern,[1] with a record of 13 cases without a death;

[1] *Am. Jour. of Obstet.*, 1871, p. 28.

Rushmore,[1] 85 cases with 20 deaths; Jewett,[2] 22 cases with 4 deaths; Trimble,[3] 26 cases with 3 deaths; Kenyon,[4] 2 cases without a death; and Davis,[5] 25 cases without a death—giving a general mortality of about 15¾ per cent.—would seem to indicate an important place for veratrum viride in the therapeutics of puerperal eclampsia. Should symptoms of collapse be manifested, from the introduction into the system of such a large amount of the drug, whisky hypodermically or *per rectum* will act as a prompt restorative. *The After-treatment.*—An attack of puerperal eclampsia is always followed by a certain amount of coma, and the intensity of this will vary according to the severity, frequency, and duration of the eclamptic seizures; at times it may be quite profound, and unconsciousness may persist for twenty-four hours or more. During this period as much as possible of the effete material in the blood should be eliminated, and this may best be accomplished by the use of large doses of a saturated solution of Epsom salts, of which 1 or 2 drams may be administered every fifteen or twenty minutes until free purgation be secured; the amount of the saline that may thus be given with immunity to a patient is often immense, amounting to 10 ounces or more in the graver cases. The anemia may be overcome by full doses of iron, and the patient should otherwise be treated as an ordinary puerperal patient. A mild diet must be maintained until every trace of albumin have disappeared from the urine, and diuretic drinks and remedies must be administered in suitable quantities. Good hygienic surroundings and nutritious food are very essential during the convalescence.

Mechanical Interference in Puerperal Eclampsia.—In those cases in which the disease occurs before the onset of labor nothing must be attempted obstetrically unless the patient's

[1] *Gaillard's Med. Jour.*, Nov., 1887. [2] *Am. Gynecol. Soc.*, 1887.
[3] *Am. Jour. of Obstet.*, 1890, p. 833. [4] *N. Y. Med. Jour.*, Oct., 1879, p. 370.
[5] *Virginia Med. Monthly*, 1894, p. 34.

life be threatened. Any attempt to hasten labor under these circumstances will only aggravate the woman's condition, renew the paroxysms, and possibly result in her death. It is more than probable that the violence of the convulsive efforts will initiate labor-pains. If this do not happen and the condition grow steadily worse, labor must be induced. Should the eclampsia complicate a labor already in progress, but in which the os is as yet but slightly dilated, the proper procedure in order to avoid further irritation of the already overwrought nervous system of the patient is to refrain from manipulative efforts until a reasonable degree of dilatation have been accomplished by the unaided uterine contractions: this will not necessitate much of a delay, for it must be borne in mind that cervical dilatation proceeds with great rapidity during the convulsions. After the necessary amount of dilatation has been secured two courses are open: If the fetal head be well engaged, forceps should be applied and labor speedily terminated; should engagement not have occurred, rapid version must be performed and the child extracted with all possible haste. If there be a roomy pelvis and labor have progressed to a considerable extent, manipulative efforts may be anticipated by a precipitate delivery of the child consequent upon the violent expulsive action of the uterus and abdominal walls. There is no fixed rule for the employment of obstetric manipulations in this disease; each case must be a law unto itself. *Halbertsma's treatment* of antemortem Cesarean section cannot be recommended.

(*d*) *Floating or Wandering Kidney* (*Renal Dislocation*).—This is a comparatively infrequent complication of pregnancy, although more common than is generally suspected. When present it is generally associated with some form of visceral ectopia, preeminently uterine displacement. The right organ is the one that is displaced in the vast majority of instances. The degree of dislocation varies from a slight change of position scarcely recognizable to the well-marked

cases in which the organ may be palpated low down in the abdominal cavity, or even grasped in the fingers and carried from place to place or to the opposite side of the body. In these graver forms it is quite possible for the long pedicle to become twisted, with consequent occlusion of the ureter and the production of a hydronephrosis and ultimate abortion. In other cases it may sink to the pelvic inlet, and, there lodging near the promontory of the sacrum, act as a serious obstruction to labor. From pressure upon the displaced organ by the gravid uterus renal congestion or organic changes may result, with consequent serious effect. In order to detect the minor degrees of renal prolapse Noble insists that the patient should be examined while in the standing posture, the body inclined forward and the hands resting upon a table. The *treatment* of this complication of pregnancy consists in a restoration of the wandering organ to its normal site, if this be possible, and its retention there by some form of support.

(2) **Affections of the Bladder and Pathologic States of the Urine.**—(*a*) *Irritable bladder* is a term ascribed to a functional disorder occurring as one of the normal clinical manifestations of pregnancy, and assuming a pathologic significance only when present in an exaggerated form. When occurring in early pregnancy it results from mechanical pressure upon the viscus by the anteflexed gravid uterus, and this is usually associated with a hypersensitive condition of the organ; as may be expected, it is more marked in neurotic women. With much less frequency it may be purely mechanical in origin, and is then generally most marked in the latter months of gestation. When occurring at this time a physical exploration will discover some form of uterine displacement—anteversion, retroversion, or prolapsus, or the downward descent of the uterus (lightening), indicating the beginning of the mechanism of labor. Usually the pressure in these pathologic states is exerted largely against

the neck of the bladder, resulting in a vesical tenesmus or even in varying degrees of retention of urine when the pressure by the uterus posteriorly drives the neck of the bladder upward against the upper margin of the symphysis pubis. As the urine continues to accumulate, there will ensue a more or less constant dribbling from the orifice of the urethra, constituting the condition known as *the incontinence of retention.* Should the retention be absolute, the bladder may become distended to an enormous extent, even reaching up to or beyond the umbilicus, and during labor it may be ruptured in consequence of the decrease in the intraabdominal space following the contraction of the abdominal walls. A very common sequel of this overdistention is cystitis of a more or less chronic type. *Treatment.*—In the minor degrees of vesical irritation, in which the trouble is mainly nervous in origin, the free administration of nerve-sedatives in combination with tonics and general systemic stimulants will answer every indication. Chloral, the bromids, the pill sedativa (Baer—containing 1 grain each of the extracts of asafetida, valerian, and sumbul), and the usual ferruginous preparations are the remedies to be employed. Moral suasion should be exercised and the best hygienic surroundings cultivated. When this method of treatment will not control the symptoms and the mechanical element in the etiology becomes more prominent, an abdominal bandage to support the antedisplaced uterus may give considerable relief. Prolonged rest in the horizontal position, an occasional sitz-bath, or hot fomentations to the perineum and suprapubic regions will occasionally afford relief. Only in extreme cases should catheterization be resorted to.

(*b*) *Cystitis.*—Inflammation of the bladder is comparatively rare in pregnancy. It results from a protracted and neglected vesical irritation or, more commonly, is gonorrheal in origin. It is characterized by frequency of micturition, the discharge of urine being associated with severe smart-

ing and burning. The urine will contain varying amounts of stringy mucus and flakes of white purulent matter. The *treatment* consists in the administration of mucilaginous drinks, diuretics, and renal alteratives, hot fomentations to the perineum, and the pursuance of a general antiphlogistic course of treatment. If the condition be very aggravated, vesical irrigation may be indicated.

(*c*) *Vesical Hemorrhoids.*—In common with the other pelvic tissues and viscera, the bladder shares in the vascular engorgement peculiar to pregnancy. Its arterioles and venous capillaries become manifestly dilated, and this process of dilatation may attain such proportions as to constitute a veritable varicose condition, the tortuous vessels protruding from the deeply-congested vesical mucosa. Not rarely one or more of these varicosities will rupture either spontaneously or under the increased tension consequent upon straining at stool or in micturition, and a hematuria ensue. Until this symptom appear the existence of vesical hemorrhoids can only be surmised. The *treatment* will consist in the administration of laxatives to relieve the pelvic engorgement, and large doses of gallic acid by the mouth. If the bleeding become extreme, it may become necessary to control it by injecting astringent solutions into the bladder.

(*d*) *Pathologic States of the Urine.*—There are various abnormal conditions of the urine that may be noted during gestation. Most common among these is *glycosuria*, occurring in from 15 to 50 per cent. of all pregnancies. In the vast majority of cases this is nothing more than a lactosuria resulting from an absorption of milk-sugar from the functionating mammæ. Especially is this condition noted just before and immediately after labor; it is not of pathologic significance. A much more serious matter is the occurrence in pregnancy of a true diabetes mellitus, or its converse, the occurrence of conception in a woman already suffering from diabetes; the two conditions seem to

exert a pernicious influence upon each other. Frequently, in such cases, gestation is brought to an untimely end by the occurrence of fetal death from placental or membranous apoplexy, and in every instance the course and intensity of the disease is aggravated by the physiologic condition. The *treatment* consists in the ordinary management of uncomplicated diabetes, with the induction of labor should the maternal condition become dangerous and death imminent. *Albuminuria*, which occurs in about 6 per cent. of all pregnancies, has already been treated under the subject of *renal inadequacy*. *Polyuria* is always present in pregnancy, and is, to a moderate degree, physiologic. When the urine is excreted in great abundance, the condition assumes a pathologic import from the disturbance and loss of rest occasioned thereby to the patient. In very rare cases the reverse, *ischuria*, may be present, the diminution in the quantity of urine voided being dependent upon some dietary error, aggravated constipation, or renal insufficiency. The urine is highly colored, concentrated, of high specific gravity, and irritating to the bladder and urethra. If the condition be not quickly corrected, a veritable renal insufficiency or an attack of eclampsia may supervene. The treatment is that already given for renal inadequacy. *Hematuria*, due either to vesical varicosities or, more rarely, to acute nephritis, acute cystitis, or vesical calculi or tumors, is occasionally encountered. It is rarely a serious matter. Its treatment may be found under the subject of vesical hemorrhoids. Other rarer urinary conditions are *peptonuria* (arising, not infrequently, from the absorption of proteid material after fetal death), *chyluria*, and *lipuria;* their pathologic import is slight, and the treatment comprises the administration of diluent drinks and the use of bland and demulcent remedies.

(3) **Pathologic Conditions of the Uterus.**—(*a*) *Malformations.*—In order to comprehend the anomalous conditions of the uterus that may complicate pregnancy it is

essential that the mode of development of this organ of generation be borne in mind. In the embryo there is formed upon either side of the body a tube, known as the *segmental* or *pronephric duct*, situated between the visceral and parietal layers of the mesoblast, and opening anteriorly into the body-cavity and posteriorly into the cloaca. From these two tubes at a later stage in embryonic development are formed the two *canals* or *ducts of Müller*, which, beginning near the anterior extremities of the Wolffian bodies—the embryonic kidneys—run obliquely downward and forward to meet in the median line, and then descend together to the urogenital sinus. The inner walls of these two opposed tubes should have become intimately fused by the eighth week of intrauterine life, the upper and divided portions retaining their entities and ultimately developing into the Fallopian tubes. By about the eighth or ninth month of fetal life all traces of the septum between these two tubes below and the depression above at their point of union should have entirely disappeared. Any arrest in this normal process of development will result in the varying degrees of *double uterus*, or *uterus didelphys*. The slightest degree of this deformity may be found in the two varieties known technically as *uterus incudiformis* (anvil-shaped uterus) and *uterus cordiformis* (cordate or arcuate uterus); in the former there is a flattening of the organ, so that its transverse diameter becomes greater than its longitudinal, and the organ presents the peculiar anvil shape from

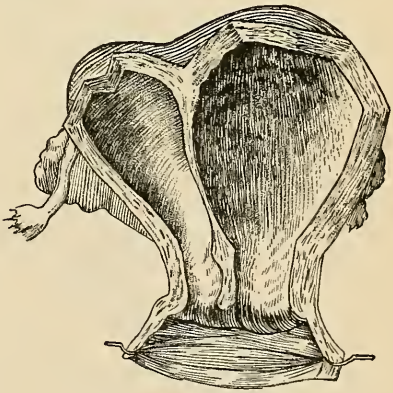

FIG. 100.—Uterus septus (Cruveilhier).

which it derives its name. When pregnancy occurs in such a uterus the fetus is compelled to assume a transverse position in order to accommodate the shape of the fetal ellipse to that of the uterine cavity. In the cordate uterus there is merely a suggestion of a duplication of the organ, the fundus not assuming its normal convex contour. The cavity in this case may be but slightly diminished in size. From these minor degrees the uterine deformity may advance through the stages of *uterus septus*, *subseptus*, *partitus*, *bipartitus*, *bilocularis*, and *semipartitus*, as they are variously termed. In these varieties, while the uterus holds approximately its normal shape externally, the partition between the two Müllerian ducts is retained in varying degrees, producing an organ with two sides or compartments. There may be but a slight persistence of the septum dividing merely the upper portion of the uterine cavity into two small loculi, or the septum may extend halfway through the length of the uterine cavity, entirely to the internal os, through the os, or down the median line of the vagina, in which case there exists the *uterus et vagina duplex*, the two Müllerian ducts retaining their entity throughout, although in close apposition, as in the normal uterus. In the *uterus bicornis* (*bicornate* or *bifid uterus*) the two tubes unite below, but this union fails to take place up to the normal height; as a result there is formed a uterus with a small body above the cervix and two cornua widely separated, each continuous with a Fallopian tube. The *uterus unicornis* results from a lack of development of one of the Müllerian ducts, its fellow undergoing the normal process of evolution; in this case the Fallopian tube of the affected side generally shares in the under-development.

It may be very clearly seen how pregnancy occurring in a uterus deformed in any of the foregoing ways will be accompanied by serious troubles. As a general rule, such a gestation is characterized by more or less discomfort or actual pain, and terminates prematurely either by rupture

of the distorted organ or by expulsion of an immature ovum. The side of the uterus that contains the embryo is carried forward by the process of uterine evolution common to pregnancy, and assumes a position at or near the median line of the body, while the unimpregnated side sinks into the hollow of the sacrum. When the diagnosis of pregnancy in an undeveloped uterus is made, the only course of treatment is to evacuate the uterus, and, if the consent of the patient can be obtained, to prevent the possibility of a recurrence of the condition the performance of a Porro-Cesarean operation is justifiable.

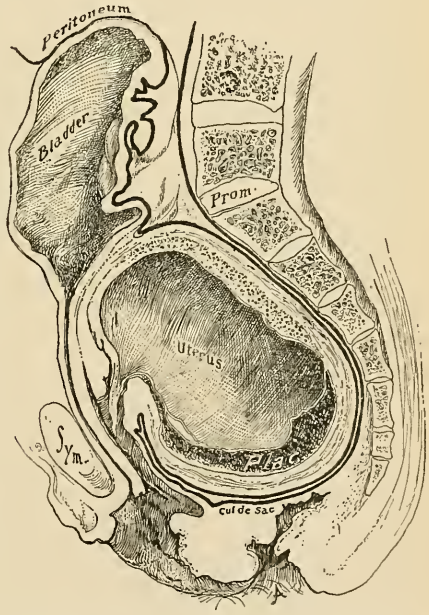

FIG. 101.—Frozen section of retroverted uterus of three and a half to four months. Death from rupture of bladder (*Arch. f. Gyn.*, Band 41, Taf. 8, f. 1).

(*b*) *Uterine Displacements in Pregnancy.*—The gravid uterus is subject to any of the known dislocations of that organ, and, owing to its increased size, such displacement may be accompanied by symptoms of considerable gravity. Most common of these displacements, and undoubtedly that of the greatest pathologic importance, is the backward turning of the womb, *retroversion* or *retroflexion.* It is probable in the great majority of instances of this dangerous and rather frequent complication of pregnancy that the physiologic condition has been engrafted upon a preexisting pathologic position of

the uterus; still, it must be admitted that excessive distention of the bladder or a severe jolt or fall may cause an acute backward displacement of an impregnated womb. A relaxed condition of the uterine ligaments may likewise permit the enlarged uterus to topple over under the influence of its increased weight, and the pathologic condition may thus result secondarily to the physiologic enlargement. *Symptoms.*—Ordinarily, beyond a slight amount of vesical irritation resulting from the pressure exerted by the upward-tilted cervix upon the neck of the bladder, and a varying degree of lumbosacral pain, this condition is not productive of discomfort to the patient during the first few weeks of its existence; as the uterus progressively enlarges the version or flexion at the internal os is proportionately overcome, and the fundus slowly rises from the pelvic cavity and sweeps past the sacral promontory to assume its normal position in the abdominal cavity: this *spontaneous reposition*, which is more likely to occur in retroflexion than in simple retroversion uteri, is accomplished without any discomfort to the patient, and even without her knowledge. The vesical irritation associated at times with dysuria, or even with some incontinence of urine, will lead the accoucheur to suspect the existence of the uterine displacement, and on physical exploration the condition will be discovered. Another termination of this complication of pregnancy is *spontaneous abortion*, from interference with the growth of the fetus: this would probably be the most common termination of the trouble were it not for the fact that there is a mechanical compression of the cervix whereby the escape of the product of conception is prevented; the organ is so rotated upon its transverse axis as to carry the cervix far up against the symphysis pubis, pressure upon which will obliterate the cervical canal. Immediately on the termination of the abortion, should this occur, the symptoms, other than those the direct outcome of the displacement itself, will subside.

Finally, mention must be made of a third and unfortunate termination of this form of displacement of the gravid uterus. In those cases in which the pathologic condition has not been discovered and corrected by the accoucheur or spontaneously by nature, the continued growth of the uterus may render impossible its escape from beneath the promontory of the sacrum, and *incarceration* will occur. This is a truly serious complication of pregnancy, which the size of the uterus does not admit of until after the close of the third month of gestation. At that time the symptoms, which may have been gradually appearing, rapidly assume threatening proportions; the dysuria that has persisted in a slight degree since conception now becomes exceedingly prominent; or there may be complete occlusion of the neck of the bladder with retention of urine. Physical exploration by the sound will reveal what appears to be an immensely elongated urethra, but what in reality is a compression of the lower extremity of the bladder by the uterine cervix, the urethra itself not being directly impinged upon. The bladder in consequence of this occlusion at its mouth becomes immensely dilated, reaching even to or beyond the umbilicus. Associated with this trouble there occurs a concomitant occlusion of the bowel from pressure by the hypertrophied and congested fundus. At first this will manifest itself in a progressively increasing constipation, with rectal tenesmus; the occlusion finally becoming absolute, there results a paralysis of the bowel with entire arrest of defecation. The suffering of the patient now becomes extreme: she complains of severe pelvic pain; edema of the vulva, perineum, and thighs may develop; persistent vomiting with discharge of fecal matter may occur; symptoms of uremic and kopremic poisoning manifest themselves; or an acute peritonitis indicates some serious accident in the pelvis, as vesical or uterine rupture or sloughing of the imprisoned organ. A vaginal examination of a woman suffering from an incarcerated retroflexed uterus will reveal

a smooth, tense tumor filling Douglas's pouch, with an absence of the fundus above on palpation through the abdominal wall. A rectal examination will permit of a more thorough examination of the mass. The cervix may not be felt at all, or may be discovered, after deep insertion of the finger into the vagina, situated at or above the top of the symphysis pubis. Examination of the abdominal surface may, in advanced cases, reveal a soft fluctuating tumor, yielding a dull note upon percussion, extending up to the region of the umbilicus; this tumor is the immensely-distended bladder, as may be demonstrated by catheterizing the patient, when the tumor will disappear. *Diagnosis.*—A physical exploration of a patient presenting the foregoing clinical picture, associated with the normal signs of gestation, will generally reveal the nature of her complaint. It is possible, however, for the accoucheur to experience some difficulty in arriving at a precise knowledge of the existing state of affairs. Thus, the distinction between a beginning incarceration of a retroflexed uterus and an ectopic gestation may be obscure, particularly if there be much abdominal tenderness. Reference to the following points of difference, however, will permit of the formation of a diagnosis, especially if an anesthetic be employed:

Incarcerated Retroflexed Uterus.	*Extrauterine Pregnancy.*
The uterus is tilted upon its transverse axis, with the cervix situated far up anteriorly and the fundus posteriorly.	The uterus may be crowded forward, but is not rotated upon its transverse axis; the cervix and fundus are normally situated.
The serious symptoms develop, as a rule, during the fourth month of gestation.	Rupture of an ectopic gestation-sac usually occurs about the eighth week of gestation.
There is vesical distention, with retention of urine.	Vesical distention is not likely to be present.
There is vulvar and vaginal edema.	There is no vulvar or vaginal edema.
The perineum is distended by the fundus uteri in advanced cases.	The perineum is normal in appearance.
Braxton Hicks' sign is present.	Braxton Hicks' sign is absent.

Prognosis.—In simple retrodisplacement occurring in the early weeks of gestation the prognosis is good as far as maternal life is concerned; in the vast majority of cases spontaneous reposition or spontaneous abortion will end

the condition. When incarceration has occurred, if the case be taken in hand early, the prognosis is still good, for with proper manipulation the organ may be replaced and gestation be allowed to continue to term. In neglected cases of retroflexion, or in those that have come under the obstetrician's notice late in their course, the maternal prognosis becomes grave. If unattended, it is possible for nature to terminate the case in one of the following ways: (1) *Spontaneous expulsion of the entire retrodisplaced uterus*, the perineum and posterior vaginal wall yielding to the violent expulsive efforts, and the uterus being extruded from the vulvar orifice through the ruptured tissues. The patient generally dies promptly of shock. (2) In very rare instances, not more than a dozen cases of which are on record in medical literature, the anterior uterine wall may stretch and form an immensely dilated sac within which the fetal body may develop to term, the head occupying a position in the hollow of the sacrum; the fetus in this condition virtually holds an oblique position in the uterine cavity, so that the shoulder or back presents at the internal os. This rare and fortunate termination is known as *sacculation of the uterus* (Fig. 102). (3) In many cases the uterus and surrounding tissues become so compressed and engorged that there is produced considerable interference with the pelvic circulation; as a consequence sloughing of the organ occurs either into the rectum or the vagina, and the contents are discharged through the fistulous tract so formed, or the patient speedily succumbs to an acute peritonitis. *Causes*

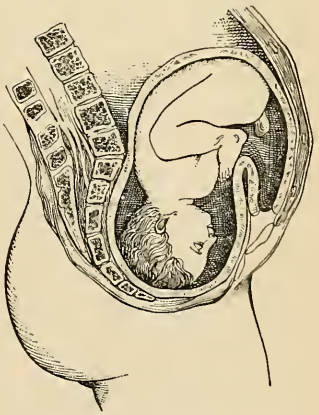

FIG. 102.—Sacculation of the uterus (Oldham).

of Death in Incarcerated Uterus.—In this unfortunate condition maternal death results from one of a number of the following causes: 1. Uremia from pressure upon the urethra and arrest of the vesical function; 2. Septic peritonitis; 3. Septicemia; 4. Exhaustion; 5. Shock following rupture or sloughing of the uterus; 6. Rupture of the bladder; 7. Pressure-necrosis of the bowel. *Treatment.*—If the case be seen early, efforts must at once be instituted to restore the displaced organ to its normal position. This involves the removal, as far as is practicable, of the cause of the displacement; the distended bladder must be emptied and the bowels rendered patulous. The patient resting in the lithotomy position, the uterus may be raised by the bimanual method, the precaution being observed of exerting pressure, with two fingers in the vagina or with a repositor introduced into the bowel, upon the fundus obliquely upward and outward in the direction of either sacroiliac synchondrosis; by this maneuver the promontory of the sacrum may be avoided and the uterus forced into position. This failing, the patient may be made to assume the genupectoral position, and pressure as before exerted upon the fundus, the influence of gravity facilitating the manual efforts. Downward traction upon the cervix grasped by a volsellum-forceps may, if combined with the foregoing method, result successfully when other efforts have failed. Usually the uterus will yield under these manipulations, and it may then be held in place by a properly fitting pessary. The patient must be confined to bed for a few days. In the cases in which incarceration has occurred a more vigorous course of treatment must be instituted. In these cases it may be impossible to introduce a catheter through the distorted urethra. When the catheter is passed, it must be borne in mind that it may have to traverse six or seven inches of the canal before the vesical cavity is reached; for this reason a prostatic catheter may succeed when the ordinary instrument has

failed. Should catheterization be impossible, it is entirely justifiable under these circumstances to perform suprapubic puncture in order to withdraw the water. The patient must then be anesthetized and efforts at replacement instituted. These proving ineffectual, the final treatment consists in the induction of abortion; and here may arise another complication. The cervix may have been displaced so far upward as to be inaccessible; it then becomes necessary to aspirate the uterine cavity through the posterior vaginal fornix; the removal of the liquor amnii by this method may so reduce the uterine bulk as to permit of a descent of the cervix, which may then be dilated in the ordinary manner and the remaining uterine contents evacuated. Should this be impracticable, vaginal hysterectomy becomes the *dernier ressort* in the attempt to save maternal life. In case of rupture or sloughing of the viscera the patient must be treated according to the condition that may be present.

Anteversion and Anteflexion.—These displacements rarely assume pathologic importance, and should be considered as complicating pregnancy only when productive of discomfort to the patient. When occurring in the early weeks of gestation they manifest themselves by an aggravation of the normal vesical irritation, which gradually disappears as the uterus rises into the abdominal cavity. A variety of anterior displacement occurs late in pregnancy in women who have already given birth to several children, or in those who are the subjects of various forms of pelvic deformity associated with increased obliquity of the pelvis and a corresponding decrease in the vertical height of that structure, as in kyphosis or rachitis. In these cases the uterus, not finding room for its growth within the pelvic cavity, rises above the pelvic brim, and, falling forward, causes a marked protrusion of the abdominal wall, constituting one form of pendulous abdomen. This condition may become so pronounced that the heavy fundus will occupy a position far below that of the cervix,

which is carried backward and upward into the hollow of the sacrum. A similar condition is produced when there occurs a separation of the recti muscles, with a median ventral hernia of the uterus through the fissure thus produced. It may readily be seen that such a state of affairs will greatly complicate labor by misdirecting the expulsive forces; under the impetus of the uterine contractions the fetal presentation will be impelled directly backward against the sacrum, and its progress thus effectually blocked. *Incarceration* of an anteflexed pregnant uterus, while exceedingly rare, may occur should the displaced organ be bound down in its abnormal position by old bands of inflammatory lymph, as after the operation of suspensio uteri. Under such circumstances the urinary symptoms steadily increase in severity until the overstretched adhesions rupture and admit of the upward movement of the uterus, or until the gestation be terminated either by the spontaneous occurrence of labor-pains or by mechanical interference on the part of the accoucheur. For the simple variety of anteflexion but little *treatment* is required. Efforts at reposition generally succeed; the bands of adhesion may gradually be overcome by gentle manipulation and by prolonged resting in the dorsal decubitus. In the cases associated with ventral hernia and pendulous abdomen the organ may be replaced and its normal position maintained by means of an abdominal binder firmly applied and worn throughout the later months of gestation and during labor. In the rare cases of incarceration, taxis under etherization may overcome the bands of adhesion: if this should prove impossible, the pregnancy must be terminated and the anteflexion treated during and after the puerperal period.

Prolapse of the uterus is also a rare displacement in pregnancy, and when present is almost invariably found in multiparæ. It may be produced in one of two ways: Very generally the conception has occurred in an organ already procident; much less frequently will the displacement oc-

cur subsequently to conception, either from a sudden traumatism, as a jar or fall, or from a sagging downward of the heavy and retroflexed organ in women who have suffered more or less destruction of the pelvic floor at a previous labor. The degree of prolapse varies: usually it is but partial, the cervix or a small portion of the lower uterine segment protruding through the vulvar orifice; in rare cases the prolapse may be almost complete. *Terminations.*—The course pursued by gestation so complicated is patent. In by far the great majority of cases there occurs a spontaneous reposition, the uterus as it increases in size slowly retreating up the vagina until it occupies its normal position, when pregnancy may continue uninterruptedly to term. In other and rarer cases the heavy uterus fails to retract, and becomes incarcerated in its unnatural position. There then follows a rapidly succeeding series of phenomena—pain; pressure upon the rectum and bladder with arrest of the functions of these organs; intense congestion of the uterus; the occurrence of uterine contractions; and, finally, expulsion of the ovum. In those cases in which there has been reported continuance of the pregnancies to term in prolapsed organs the probable condition is one of hypertrophic elongation of the infravaginal portion of the cervix, the body proper of the uterus occupying its normal position. *Treatment.*—

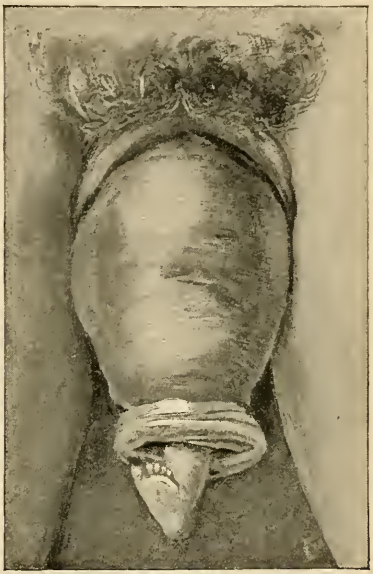

FIG. 103.—Partial prolapse of the womb in labor (Wagner).

As soon as this displacement is discovered the uterus should be returned to the pelvic cavity and retained there by a properly fitting ball-pessary held in place by a bandage. This should be worn until the organ attains a size sufficient to prevent its descent through the vagina. If incarceration have taken place, efforts at reposition must be made. The woman should be placed at rest in the dorsal position with her hips elevated, and ice applied to the congested organ; by these measures the congestion may so far be overcome that reposition will be rendered possible; if necessary to facilitate this, anesthetization may be resorted to. If the parts be so edematous and so tightly bound down by inflammatory adhesions that a replacement is impossible, the induction of abortion is indicated. After confinement the gynecologic condition should be treated.

Lateral Displacements of the Uterus.—These are unimportant changes in the uterine position, generally dependent upon some congenital vice of conformation and development. A certain amount of tilting of the organ to the right is physiologic, and is produced by the situation of the bowel posteriorly and to the left. In rare cases the entire organ is carried bodily to one or the other side of the pelvis in consequence of a congenital shortening of the broad ligament upon that side; to this condition is assigned the name of *lateroposition* of the uterus; it has no effect upon the course of gestation. A flexion of the uterus to one or the other side is a result of nondevelopment of that side toward which the fundus is inclined; it may complicate labor by producing an oblique position of the fetus. A rotation or *torsion* of the uterus from left to right to a limited extent is physiologic: if, however, it become excessive, so that the lateral aspect of the womb is caused to present anteriorly, the condition is abnormal, as in certain cases of severe inflammatory disease of the pelvis. The ligamentous structures are twisted and distorted, and the ovary of the affected side may be carried well forward in the abdom-

inal cavity, where it will be exposed to pressure by the abdominal muscles or during the manipulations peculiar to labor. The malposition should be corrected by operative procedures after labor.

(*c*) *Hernia of the Gravid Uterus.*—It is exceedingly rare for the uterus in pregnancy to participate in a hernial protrusion: when such a complication exists, however, it will be, in the order of frequency, either as a ventral, an inguinal, or an umbilical hernia. Ventral hernia, generally consequent upon separation of the recti muscles, is the commonest form of uterine hernia; the other varieties are mainly congenital in origin, and are not infrequently associated with congenital malformations of the organ, as the bicornate uterus. The *symptoms* of the ventral variety are unimportant and readily alleviated: when the hernia takes place into an inguinal canal, however, symptoms of incarceration and strangulation promptly supervene. The *diagnosis* is rendered easy by noting the absence of the uterus from its normal position, the presence of the enlargement and protrusion at the site of the hernia, and the history of the signs of pregnancy. The *prognosis* is good in the ventral variety, grave in the inguinal. *Treatment.*—Ventral hernia may be controlled by means of a tightly fitting abdominal binder and pad until the close of labor; after the puerperium it would be advisable to resort to operative measures in order to prevent recurrence of the condition. As soon as hernia into an inguinal sac be discovered, the induction of abortion is indicated if efforts at reposition fail. If the child be viable, a Porro-Cesarean section is indicated.

(*d*) *Metritis.*—Inflammation of the uterus is a not infrequent complication of pregnancy, and is generally of long standing, the physiologic having been engrafted upon the pathologic condition. The symptoms of the preexisting disease are greatly aggravated under these circumstances, and the condition of the patient may become serious. There may be intense pain in the pelvis, with the characteristic bearing-

down sensation. The irritation of the diseased uterine tissue consequent upon the rapid growth of the organ causes an intensification of the reflex manifestations; there are thus produced some of the gravest forms of the pernicious vomiting of pregnancy. Very generally abortion results either from apoplexy of the ovum or from loosening of the membranes with hemorrhage. The *treatment* is unsatisfactory at the best. Any form of application usually employed in the management of uncomplicated metritis, as the glycerin-tampon, may result in the induction of abortion, and if such a course be adopted, the patient must be fully warned of the probable result. In the cases of pernicious vomiting abortion must be induced to save maternal life.

(*e*) *Hysteralgia* (*Uterine Rheumatism*).—Certain women will suffer from neuralgic attacks in the womb of varying intensity at irregular intervals throughout gestation; these attacks will be accompanied by contraction of the uterine muscles without cervical dilatation, and will be unassociated with systemic disturbance. The *etiology* of these neuralgias is quite obscure, but they have been noticed to follow undue exertion, as violent coughing or the lifting of heavy weights, whereby the abdominal muscles are brought to bear heavily upon the gravid uterus; in some hypersensitive women the fetal movements even have been productive of severe uterine myalgia. A certain proportion of these cases will present a very patent rheumatic history, and in them the condition may be classed as uterine rheumatism. This is especially common during the closing months of gestation, and the attack is precipitated in those so inclined by any of the common causes of rheumatism, as exposure to cold, damp, and draughts. The pain may be localized in one portion of the uterus, as the fundus, or may be general; it is increased by pressure and by the occurrence of the intermittent uterine contractions; it is inconstant, and may be peculiarly paroxysmal in its nature. A not infrequent accompaniment is the occurrence of vesical tenesmus,

probably due to an involvement of the bladder in the morbid process; there are also, as a rule, some systemic manifestations, as in rheumatism elsewhere. In certain cases the paroxysms may become so severe as to institute true labor-pains and induce a premature expulsion of the ovum. *Treatment.*—For the simple neuralgias of the womb absolute rest and the application of emollient and narcotic substances over the uterine tumor will generally result in a cure. The rheumatic cases will respond very promptly to full doses of sodium salicylate or salicylic acid, from 10 to 15 grains, two or three times daily.

(*f*) *Tumors of the Uterus.*—Neoplasms of the gravid uterus are generally fibrous or myxofibrous in nature. Their growth, owing to the increasing vascularity of the organ, is usually rapid, but, while often causing a certain amount of pain and pelvic distress, as a rule they do not exert a deleterious effect upon the gestation; they may, however, very seriously complicate labor. Small polypoid tumors are not infrequent upon the cervix uteri, and these may be productive of excessive hemorrhages. If their removal be attempted before term, the possibility of a premature termination of gestation must be remembered.

(*g*) *Spontaneous rupture of the uterus* is an exceedingly rare accident of pregnancy, resulting generally from some previous condition that has left the uterine wall in an extremely weakened state. Such cases usually present the history of a prolonged endometritis or metritis, with consequent morbid changes in the tissues of the uterus, so that the latter becomes attenuated at points. The progressive distention of pregnancy eventually causes a rupture at one of these weakened spots, usually at or near the fundus, and not seldom immediately over the point of implantation of the placenta. Other causes of rupture may be direct traumatism; a previous uterine rupture; Cesarean section or hysterotomy (myomectomy) for uterine fibroids; or an unrecognized interstitial or cornual pregnancy. The

symptoms are those of concealed hemorrhage with profound shock and early death. The fetus may escape into the abdominal cavity, when palpation will reveal a material decrease in the size of the uterine tumor, which may or may not be firmly contracted, and the presence of a second tumor behind or to one or the other side of the uterus. The *prognosis* is grave. *Treatment* consists in an immediate abdominal section, with removal of the blood-clots and the product of conception, and a thorough antiseptic toilet of the peritoneum. The uterine wound must be sutured as in the Sänger method of Cesarean section. Occasionally a Porro operation may be indicated.

(*h*) *Cervical Disease.*—Granular erosion of the cervix accompanying an old laceration—a true endocervicitis, manifesting itself by an annoying profuse purulent discharge—and, rarely, a carcinomatous degeneration of the cervical tissues, have occasionally been encountered in pregnancy. It is unusual for these conditions to cause any serious trouble during the gestation, but at the time of labor they may constitute a somewhat grave form of obstruction to the descent of the fetus. In marked cases of cervical laceration an untimely termination of pregnancy is by no means uncommon. Treatment must consist in nothing more than the application of antiseptic and astringent solutions through a Ferguson speculum in order to avoid the induction of abortion.

(4) Diseases of the Vulva and Vagina.—(*a*) *Inflammation.*—Various forms of vaginitis may occur in pregnancy, most important of which is that due to gonorrheal infection. Simple vaginitis is productive of an increase in the leukorrheal discharge that is peculiar to pregnancy, together with a sense of heat and discomfort. The gonorrheal form is accompanied by a profuse purulent discharge containing the gonococcus, by an irritable condition of the bladder, by some urethritis, by considerable pain, and frequently by the development of an abscess in one or both glands of Bar-

tholini. While a source of great discomfort to the patient during gestation, the most serious results occur to both mother and child at the time of parturition. The presence of the specific germs renders the development of septic changes probable, and a grave or even fatal form of septic salpingitis and peritonitis may promptly follow an extension of the infection from absorption of the poison through the lacerations and abrasions of parturition. The infant in its passage through the diseased parturient canal comes in contact with the pathogenic germs, and may develop in a few hours a virulent form of gonorrheal ophthalmia that may result in a total loss of sight. These grave sequelæ of gonorrheal vaginitis must be borne in mind as soon as the condition be discerned prior to the onset of labor, and vigorous therapeutic measures must be instituted to avert such disastrous consequences. *Treatment.*—In the simple nonspecific vaginitis the vulva and vagina should be bathed daily with warm antiseptic fluids, avoiding, however, the use of the douche. In the gonorrheal form of the disease vaginal douches are entirely justifiable, and should consist of a solution of mercuric chlorid (1 : 2000); these douches may be administered twice daily, and should be followed by the introduction of a tampon of wool or cotton containing pure tannic acid, the glycerol of tannin, or a mixture of iodoform and tannic acid. To counteract the alkalinity of the vaginal secretions Döderlein's suggestion of the application to the vaginal walls of a solution of lactic acid (1 per cent.) may be adopted. *Winckel's disease, colpohyperplasia cystica*, is a form of vaginitis characterized by the development upon the vaginal walls of numbers of small transparent cysts containing a gaseous substance; upon perforation of the cyst-wall, these collapse with an audible sound. There is associated with this formation an increase of the normal leukorrhea, but otherwise no disastrous results attend its occurrence.

(*b*) *Varicosities.*—Dilated veins are not infrequently present

in both the vagina and vulva, though rarely extending above the lower third of the former. All that can be done for them is the avoidance of excessive constipation, the removal of anything that will obstruct the pelvic circulation, and the use of protective dressings to avert the danger of rupture from traumatism. Mild laxatives, the abolishing of tight dressing and lacing, and the wearing of an abdominal bandage to support the heavy uterus will conduce to this end. A T-bandage will aid in supporting the enlarged veins and will tend to prevent accidental injury.

(*c*) *Vegetations* are often noticed in and around the vulva, and are very generally a sequel to gonorrheal infection. They are known as *gonorrheal warts* or *pointed condylomata*, are cauliflower-like in appearance, of a pinkish tint, and may give rise to more or less itching, pain, and offensive discharge. As a rule, nothing will be indicated in the line of treatment other than the application of a protective dressing; any attempts at removal may be followed by the onset of labor-pains. If the condition, however, become excessively annoying to the patient, more vigorous measures may be adopted. Operation by the knife is exceedingly hemorrhagic, and a better method of removal would be the use of a strong caustic agent, as chromic acid. In many cases applications of astringents and drying-agents will answer every purpose. Glycerol of tannin, Labarraque's solution, and powders of calomel and bismuth or of salicylic acid and starch have been used with benefit. The vegetations usually disappear entirely or diminish very considerably in size after parturition.

(*d*) *Vaginal Prolapse.*—A certain amount of falling of the anterior vaginal wall, associated with a slight degree of cystocele, is not uncommon in pregnancy. It results from the increased congestion and consequent increased weight of the vaginal tissues (the edema of the cellular structures that generally exists causing a loosening of the mucosa from the subjacent structures) and the pressure from above

exerted by the gravid uterus. The symptoms are vesical tenesmus and irritation, and rectal irritation should the posterior wall participate in the condition. The treatment consists in a reposition of the displaced vaginal walls, and their retention *in situ* by means of a properly fitting pessary or by vaginal tampons inserted daily and held in place by a T-bandage. The bowels must be maintained in a patulous condition and the wearing of tight clothes prohibited. During labor such a condition may prevent the ready escape of the fetus.

(*e*) *Pruritus vulvæ* may complicate pregnancy. In nature it may be purely a neurosis, while in many cases it is secondary to irritating leukorrheal discharges. The itching may become intense and prove very resistant to treatment. A multitude of remedies have been suggested for its relief, prominent among which are lotions of mercuric chlorid, 1 : 2000, and an ointment of menthol, from 10 to 15 grains to the ounce of lanolin; a solution of borax with a little morphin in rose-water is a very elegant and effective application. Carbolic acid or cocain may be employed with success in some cases.

(*f*) *Edema of the Vulva.*—A dropsy or serous infiltration of the vulvar tissues is not uncommon in those cases of pregnancy associated with renal insufficiency. Such a condition may also occur from direct mechanical pressure by the gravid uterus upon the pelvic veins, and then may be either unilateral or bilateral. It may be a part of a general anasarca or it may result from abscess of a Bartholini's gland. The labia become at times enormously swollen, and from attrition they may become excoriated or even the seat of deep ulcers. *Treatment.*—If the edema be slight, a removal of the cause, if this be possible, together with the application of hot fomentations, will generally relieve the condition. In some cases great relief may follow slight puncturing of the skin in order to permit of the escape of the exuded fluid.

(5) **Pathologic States of the Mammæ.**—Disorders of the mammary glands are very unusual in pregnancy. The most common pathologic condition noted, aside from ill development of the nipples, is an intractable form of eczema of the nipples, which, despite the best of treatment, will, when once established, generally persist until the termination of labor. Abscess of the breast has been noted.

6. Diseases of the Nervous System.

(1) **Gestational Insanity.**—It is rare for insanity to develop during gestation. When it does appear at such a time, it is generally in those individuals in whom there exists a strong predisposition to mental disorder: it may, however, occur in any pregnant woman as a result of excessive fright or long-protracted anxiety. As a rule, the type assumed is that of melancholia, often with a tendency to self-destruction. The usual period for its appearance is about the third month, and most commonly in elderly primiparæ. When once developed, the condition will generally persist until after parturition. The best treatment is confinement in an asylum until after birth of the child.

(2) **Insomnia.**—The occurrence of sleeplessness in pregnancy, especially toward the close of gestation, may be overcome by the judicious use of nerve-sedatives, as chloral, potassium or sodium bromid, sulfonal (5- to 10-grain doses), and the antispasmodics, notably camphor, valerian, and asafetida. The danger of the formation of the opium-habit will debar the administration of opium and its alkaloids.

(3) **Vertigo and Syncope.**—Dizziness, with or without fainting-spells, is especially liable to occur in women who are essentially hysteric in nature; and may result in part from the extreme anemia that complicates pregnancy, or it may foreshadow an impending eclamptic seizure and be associated with varying grades of albuminuria. The *treatment* consists in the use of aromatic spirits of ammonia, cold water, and smelling-salts during the attack, and, in the

intervals, the administration of tonics, especially iron, and the nerve-sedatives and antispasmodics, together with diuretics and laxatives.

(4) **The Neuralgias of Pregnancy.**—It is not uncommon for the pregnant woman to complain of neuralgic pains in various portions of the body. Those occurring in the uterus itself have already been mentioned; other common situations are the head, hands, teeth, face, and breast. *Tic douloureux* (*face-ache*), or neuralgia of the fifth nerve, is often noted. Like all these neuralgic affections, it is quite intractable to treatment. Sedative applications, as those containing aconite or belladonna, and liniments of chloroform or camphor, may be tried; in very severe cases hypodermic injections of morphin must be administered. Internally, nerve-sedatives, as the bromids, chloral, or croton-chloral (in from 2- to 10-grain doses) will be of service. Mild galvanism may relieve the patient. By far the most frequent of the neuralgias of pregnancy is *odontalgia*, or *toothache*, which may or may not be accompanied by caries of the teeth. Usually it is the lower maxilla that is affected, and the pain may be unilateral or bilateral; it very generally subsides by the close of the sixth month of gestation. It requires the treatment already given for face-ache; in addition, the bowels must be kept patulous, and sedative mouth-washes, together with the application to the gums of sedative plasters (as of capsicum), should be employed. Should caries be present, appropriate treatment is indicated: it must be remembered, however, that slight operations on the teeth may be sufficient to initiate labor-pains. *Pains in the muscles of the abdomen*, and *lumbago* have also been noted in pregnancy, especially toward its close. Occurring near the ensiform cartilage or low down in the inguinal regions, they result from excessive stretching of the attachments of the abdominal muscles. These pains are aggravated by voluntary motion, by pressure, and even by the fetal movements. In some cases they may be entirely dependent upon a hypersensitiveness of the cuta-

neous nerves of these regions. Gentle rubbing with narcotic applications or slight blistering of the affected regions will generally allay the pain; subcutaneous injections of morphin may be required for severe cases. *Cramps in the thighs and in the legs* are frequently complained of late in pregnancy and during the progress of labor. They are probably produced by the pressure exerted by the gravid uterus and advancing fetal presentation upon the lumbar and sacral plexuses of nerves. Attention to the bowels and a change in the position of the patient will often promptly correct these painful seizures. *Cephalalgia* and *migraine*, if present, may be counteracted by the prompt administration of chloral, the bromids, and tonics, and attention to the rules of hygiene.

(5) **Gestational Paralysis.**—Various forms of paralysis may complicate gestation, and these have inappropriately received the name of *puerperal* paralysis: a much more fitting term, we think, is that given at the heading of this paragraph. Gestational paralysis may assume the form of a paraplegia, a hemiplegia, facial paralysis, or paralysis of the nerves of special sense. *Paraplegia* may be traumatic in origin, or may result from pressure upon the pelvic nerves by the fetal head, or from exhaustion of the spinal irritability. It exerts no deleterious effect whatever upon the pregnancy nor upon the labor; in fact, women so afflicted may have much less difficulty in parturition than those in full control of their voluntary muscles. *Hemiplegia* is rather common in pregnancy. It may result from cerebral apoplexy following congestion of the brain, or, more rarely, from cerebral anemia, the hemorrhage in the latter case being an outcome of the hydremia of pregnancy; or it may occur without the coexistence of any grave structural lesion of the nerve-centers. It cannot be said to constitute a grave complication of pregnancy and labor, other than the inconvenience afforded the patient by the condition. *Treatment* consists in the administration of tonics and strychnin and in faradization

of the affected limb. The paralysis generally disappears after parturition. *Facial paralysis* is a rare condition in pregnancy, and may possibly result from the hydremia and anemia that are present. Paralysis of the nerves of special sense will result in *amaurosis* or *deafness* according to the nerve involved. In cases of amaurosis, partial or complete, the presence of renal disease should always be suspected and a urinary examination made. Occasionally, however, the blindness is entirely due to an anemic state of the retina. As a rule, both eyes are affected. If there have not occurred an effusion of blood into the retinal tissues, the sight will probably be restored when the uterine contents are evacuated. Deafness is generally a temporary condition, and, while at times associated with albuminuria, in many instances is absolutely inexplicable. It may be unilateral or bilateral, and generally disappears when pregnancy is terminated.

(6) **The Neuroses Complicating Pregnancy.**—*Hysteria* to some extent exists in all pregnant women. The normally excitable nature of the woman is profoundly impressed by the existence of gestation, and any trivial cause may precipitate an hysteric paroxysm. Under such circumstances moral suasion alone will suffice to correct the condition; drugs are of no avail. It is possible for the hysteria to develop eventually into true insanity. *Epilepsy* is rare as a complication of gestation, largely from the fact that epileptic women are sterile in the vast majority of cases, probably because of the under-development of their genital organs; when such women do conceive, however, the disease generally does not unfavorably influence the course of the pregnancy. There may apparently be an arrest of the nervous disease, the spasms often disappearing entirely during pregnancy, only to reappear after parturition. When an epileptic seizure occurs, the condition must be diagnosed from puerperal eclampsia: this can be done by an examination of the urine, which is albuminous in the latter condition. The children of epileptic women almost invari-

ably die soon after birth from a transmission of the maternal disease. *Chorea* in its milder forms is occasionally encountered in pregnancy, and mainly in primigravidæ (in over 60 per cent. of the cases). The etiology of the disease is either an hereditary neurotic tendency, a former occurrence of the disease in the individual, or the ordinary causes of chorea—anemia and rheumatism. Its usual time of occurrence is during the first few months of gestation, and, having once appeared, it generally persists throughout the pregnancy, and even exhibits a remarkable tendency to recur in succeeding pregnancies. It does not manifest itself during sleep. In its grave forms it not infrequently results in maternal death following premature expulsion of the ovum. The mortality of such cases is about 30 per cent. The causes of death are muscular exhaustion, syncope, and the sequelæ of abortion. In a certain proportion of the cases incurable insanity develops. The *treatment* is that of the uncomplicated disease—iron, Fowler's solution, tonics, nutritious diet, and good hygienic surroundings. In the graver forms it may become necessary to prematurely terminate pregnancy. *Tetany*, or a tonic contraction of the muscles, usually confined to the wrists, but at times appearing elsewhere, may develop during gestation; as a rule, it is a matter of but little gravity, but should the muscles of respiration become involved in the tetanic process, death from strangulation may follow, due to interference with the respiratory muscles. The *treatment* is that of uncomplicated tetany.

7. Diseases of the Osseous System.

(1) **Relaxation of the Pelvic Articulations.**—While, to a limited extent, a loosening of the pelvic joints from serous infiltration is physiologic in pregnancy, this separation of the bony structures may become so excessive as to constitute a veritable pathologic condition. It then becomes a source of great discomfort to the patient, giving to her a sense of insecurity and lack of support, or even rendering

locomotion impossible. Simple movement of these relaxed joints may be productive of intense suffering to the patient, the pain radiating into the loins and down the thighs. Most commonly it is the symphysis pubis that is affected, and usually the symptoms do not manifest themselves until after the sixth month of gestation; once begun, however, the undue relaxation is very liable to progressively increase until the end of gestation, after which there is a slow return to the normal condition of the parts. The *diagnosis* of the pathologic state may be made by causing the patient to assume the standing posture, and then to shift her weight from one limb to the other while the accoucheur, resting upon his knee before her, inserts a finger into the vagina and rests it upon the inner surface of the symphysis. Another method is to place the patient in the dorsal position and alternately flex and extend the femurs, a finger at the same time being inserted into the vagina and caused to rest upon the various pelvic articulations. *Treatment* consists in rest in bed, with the firm application of a binder of linen, leather, or thin metal around the hips; this should be worn after labor until the joints have assumed their normal degree of mobility. A plaster-of-Paris cast may be employed in severe cases.

(2) **Inflammation of the Pelvic Joints.**—Occasionally, though very rarely, an inflammatory action is set up in the softened and relaxed joints. It manifests itself by severe pain, of a heavy, boring nature, with sharp, lancinating exacerbations, and tenderness on motion and pressure over the affected joints; occasionally there is a small amount of edema and a slight degree of pyrexia. The *treatment* consists in rest in bed, the wearing of a binder, sedative applications and, if necessary, the administration of small doses of narcotics.

(3) **Osteomalacia.**—Osteomalacia, or decalcification of the bones, is an exceedingly rare condition in the United States, although of frequent occurrence in certain portions of

Europe, notably in Italy. It is produced by a variety of osteitis and periosteitis, probably resulting from defective nutrition of the parts, in combination with imperfect hygienic surroundings. The parasitic origin of the disease has not been fully established. Its main symptom is the intense boring, or at times acute, pain in the affected bones, which may be confounded with rheumatism; in course of time the bones undergo a process of softening and distortion, giving rise, when there is an involvement of the innominate bones, to the peculiar formation of the pelvis that is known as the *beaked* or *heart-shaped pelvis.* The *treatment* of the condition consists in the administration of full doses of phosphorus and a nutritious diet, with rest in bed. After pregnancy castration should be performed in the hope of arresting the progress of the disease.

8. Diseases of the Cutaneous System.

(1) **Increased Pigmentation.**—The cutaneous pigmentation that is normally present in pregnancy to a moderate degree may become immensely exaggerated in certain individuals, and even so marked as to constitute a true physical deformity. The spaces of the face—the brow, the cheeks, and the chin—may be darkened uniformly, constituting the condition known as the *mask of pregnancy;* in other cases the blotches are irregularly scattered over these regions, appearing in spots of varying size, but usually symmetric in form; these are known popularly as *liver-blotches*, *liver-spots*, or *freckles*, and technically as *chloasmata* or *ephelidæ.* The areas of pigmentation are strictly confined to the open spaces and do not extend into the hairy scalp. They may also appear, although much less frequently, upon the breasts, thighs, and abdomen. Very generally they will disappear after parturition. They do not give rise to any subjective sensations. No *treatment* is indicated.

(2) **Pruritus.**—Itching of the skin, while commonly confined to the region of the genitalia, may become general,

and then is a source of intense suffering to the patient. In such cases it is often most marked over the abdominal surface, and instances have been noted in which the neurosis was so exaggerated as to result in a premature discharge of the ovum. The *treatment* of this general form consists in the administration of alkaline baths—the ordinary soda-bath or one of potassium carbonate (five ounces of the salt to the bath)—and frictions with sedative lotions, as camphor or chloroform liniment, a solution of cocain, and preparations containing opium, carbolic acid, or aconite.

(3) **Herpes Gestationis.**—This is a peculiar neurotic skin-affection occasionally encountered in early pregnancy and running a protracted course, lasting until after parturition. The eruption is multiform, partaking of the nature of pemphigus and erythema, and showing on different portions of the body papules, vesicles, and bullæ. Its *treatment* consists in the administration of nerve-sedatives, together with regulation of the mode of life.

(4) **Impetigo herpetiformis** is a very serious skin-disease but rarely seen complicating pregnancy, and when encountered appearing especially toward the close of gestation. Its usual location is in the folds of the body, around the groins, umbilicus, and axillæ, and under the mammæ, the lesions, which are pustular in nature, spreading thence until they involve the entire cutaneous surface. There are marked concomitant symptoms of systemic disturbance—high fever of the intermittent type, associated with chills, gastric disturbance with vomiting, extreme prostration and delirium, followed often by coma and death. The *treatment* is symptomatic, with soothing applications locally.

(5) **Purpura hæmorrhagica** very rarely complicates pregnancy, but when encountered runs a very rapid course to a fatal termination, death always being preceded by premature expulsion of the ovum. The cause of maternal death is profound exhaustion, postpartum hemorrhage, or sepsis.

IV. DYSTOCIA.

In very many instances labor does not pass through its successive stages in the simple and uncomplicated manner portrayed in a preceding portion of this volume: there are a multitude of accidental or pathologic conditions, of varying degrees of gravity, that may interrupt its normal mechanism and give rise to obstruction to fetal descent and expulsion. To these irregularities in the progress of labor has been given the name of *pathologic or difficult labor*, or *dystocia*, from two Greek words meaning painful or difficult labor. If the abnormality of the labor be dependent upon some form of fetal irregularity, the condition is known as *fetal dystocia*, while if it be dependent upon some defect of or accident to the mother, it constitutes a variety of *maternal dystocia*. Under these two main headings will be described the various abnormal states that may be encountered during the process of parturition.

1. Fetal Dystocia.

The conditions connected with the fetus that may in any way render its entrance into the world difficult or even impossible if unaided by the accoucheur, or that in any way threaten its existence, may be grouped as follows: (1) Malpositions and malpresentations; (2) Fetal diseases and malformations; (3) Abnormalities of the fetal appendages; and (4) Fetal accidents.

(1) **Dystocia due to Malpositions and Malpresentations of the Fetus.**—(*a*) *Backward Rotation of the Occiput in Vertex Presentations.*—In certain cases of posterior vertex presentations it not infrequently happens (in about 2 per cent. of the cases) that the great law of the mechanism of labor—anterior rotation of the fetal presenting part—fails of fulfilment. When this occurs the expulsion of the fetus from the parturient canal becomes exceedingly difficult and protracted, and considerable damage to the soft structures

of the pelvis will almost inevitably follow. Extensive laceration of the perineum, involving the sphincter ani muscle, and even extending up the rectovaginal septum for a varying distance, is the rule. It may very readily be seen why the characteristic delay and damage should occur. Instead of lodging under the symphysis pubis while the softer structures of the face sweep over the perineum to emerge at the posterior portion of the vulvar outlet, the large, firm occipital portion of the fetal skull is driven down the sacral curve by the uterine contractions, and forward over the immensely distended pelvic floor to emerge at the vulvar outlet: this process necessitates the traversing of at least 25½ cm. (10.03935 in.) of space, half of which is the sacral depth and half the anterior continuation of the pelvic floor; the soft structures cannot undergo the tremendous distention thus entailed, and generally yield before the advancing head. *Etiology.*—There are various causes assigned for this anomaly in the mechanism of vertex presentations. In a large percentage of the cases it results from a failure of the head to assume the condition of extreme flexion, whereby some other portion of the skull, as the chin or brow, will first meet the resistance of the pelvic floor, and will advance under the symphysis while the occiput retreats into the hollow of the sacrum. In other cases, in which there has occurred a partial extension of the head, the relationship of the fetal head to the maternal pelvic inlet is sufficiently disturbed to cause an engagement of the occipitofrontal diameter (11¾ cm.—4.6259 in.). It will be impossible for this large diameter to rotate anteriorly through the small transverse and into the opposite oblique diameter of the pelvic inlet, and the only course left for it to pursue is a backward rotation into the hollow of the sacrum. In still another, and quite a numerous, group of cases flexion of the head may be perfect, but the resistant forces of labor are deficient, as will be the case when there exist old lacerations of the perineum or over-

size of the pelvic cavity; here, again, the head, failing to advance, swings backward into the posterior position. Again, if the fetal head be under-sized or a certain amount of uterine or abdominal inertia exist, the head will not be driven against the pelvic floor with sufficient force to ensure its advance toward the symphysis, and, instead, it will as before swing backward into the sacral cavity. Finally, there may exist some great obstruction to the forward rotation of the head, flexion and the forces of labor being normal. Thus, in complex presentations, as of the vertex and a foot or hand; when there exists some variety of contracted pelvis, as the justominor and the kyphotic; or when there is an over-size of the fetal head, as in hydrocephalus,—the occiput under any of these circumstances finds its best accommodation in the posterior position. Also, an extreme prominence of the sacral promontory will present an obstruction to the forward sweep of the shoulders, and the occiput as a result will enter the cavity of the sacrum. *Diagnosis.*—Vaginal examination in these cases reveals the occiput and smaller fontanel posterior in the median line, while anteriorly the bregma is within easy reach (Fig. 104). The sagittal suture corresponds to the conjugate diameter of the pelvis. If the complication be the result of an imperfect perineal floor, the head will be low down in the pelvic cavity, while if it occur from some insuperable obstacle to entrance into the superior strait, it will be found resting high up upon the pelvic brim. Abdominal palpation will, in the latter class of

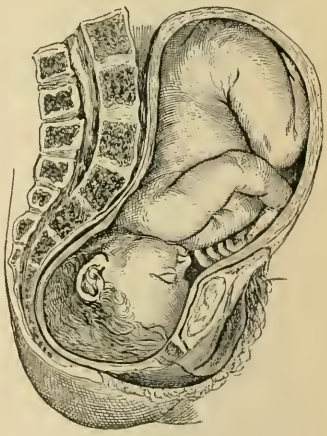

FIG. 104.—Backward rotation of the occiput.

cases, show an anterior median situation of the fetal extremities, with a transverse position of the shoulders; the head may be readily mapped out, while the fetal heart-sounds will be indistinct, and only heard far back in the flanks, or they may be altogether absent. *Fetal Diameters Involved.*—The diameters of the fetal head engaged in the mechanism will be the same as in ordinary vertex presentations in some instances; in many cases, according to the degree of extension that has occurred, the bitemporal diameter—8 cm. (3.1496 in.)—may be substituted for the biparietal, and the occipitofrontal—11¾ cm. (4.6259 in.)—for the trachelobregmatic diameter. *Steps of the Mechanism.*—If the case be left to nature, it is quite possible in many instances for a spontaneous termination of the labor to occur. This is accomplished in the following manner: 1. There occurs a *tremendous increase of flexion* as the occiput is driven down the parturient canal to the vulvar orifice, where the anterior fontanel presents; 2. Engagement of the brow under the symphysis; 3. Birth of the occiput in a state of extreme flexion, the perineum retracting over the advancing head; 4. Delivery of the face by a process of partial extension, the nape of the neck resting on the retracted perineum; the parts emerge from under the symphysis in the following order: Supraorbital ridge, nose, upper maxilla, mouth, and chin; 5. There follows a very violent external rotation as the shoulders sweep around within the pelvic cavity to assume an anteroposterior position; 6. Delivery of the shoulders and remaining portions of the body. *Dangers.*—The risks to both mother and child in such a condition as this are manifest. 1. *Fetal.*—The mortality of the child increases considerably under these adverse circumstances; from 9 to 15 per cent. of such children perish from fatal cerebral compression, pressure upon the cord, injuries contracted during operative manipulation, and interference with the placental function from tetanic contraction of the uterus. In every case

of difficult posterior occipital delivery the normal configuration of the fetal skull is much distorted as a result of the extreme pressure to which it has been subjected. There is an immense and quite distinctive increase in the occipitomental diameter, with a corresponding decrease in the transverse diameters: this disfiguration will generally disappear within a few days after birth. 2. *Maternal.*—Grave perineal laceration is the rule in these cases, and, if unaided, the mother will become more or less exhausted or even perish. In some cases the occiput may become firmly lodged above the point of obstruction, such as a prominent sacral promontory or a protruding ischiac spine, and, the pressure continuing from above, a process of extension occurs, with the resultant conversion of the presentation into one of the anterior fontanel, the brow, or the face, according to the degree of deviation produced. *Treatment.*—The treatment varies according as to whether engagement of the part has not yet occurred, or whether posterior rotation has followed after the head has advanced as far as the pelvic floor. (1) *The Head Above the Pelvic Brim.*—The indications under these circumstances are, first, to secure, if possible, complete flexion of the fetal head, and, secondly, to secure and maintain a normal equilibrium between the forces of labor. Perfect flexion may be favored before rupture of the membranes by placing the patient in the lateroprone or obstetric position on that side toward which the occiput is directed; the fetal body is then carried in the same direction, and the occipital portion of the head again becomes the short arm of the lever, so that the main bulk of the resistant force falls upon the anterior portion of the head, which is thus driven up upon the chest: in this way the occiput becomes the most dependent portion of the fetal presentation and its anterior rotation may follow. The genupectoral position may in some instances accomplish the same purpose. *West's method* consists in making upward pressure upon the brow in the hope of causing a descent of the occiput. The ex-

pulsive power of the woman may be increased by the administration of slight stimulus, as a glass of sherry or a large dose of quinin. If the membranes have already ruptured and the head still remain above the pelvic brim in the posterior position, it would be quite proper to introduce one hand—that corresponding to the fetal back—through the internal os, and with the assistance of the abdominal hand accomplish an anterior rotation of both the occiput and the shoulders—the latter to prevent a return of the head to its original position. (2) *The Head Lodged within the Pelvic Cavity.*—In many of these cases backward rotation has occurred on account of a deficiency in the amount of resistance afforded the advancing head by the pelvic floor; this follows in cases of relaxed or lacerated perinei. Under such circumstances an extension of the head again occurs: this may be remedied by reverting to the maneuver already described. Should the change in the maternal position not result favorably, the resistant force may be restored by placing the index and middle fingers of the hand corresponding to the fetal back upon the posterior surface of the occiput, against which forward pressure is exerted; a single blade of the forceps used as a vectis will accomplish the same purpose. If, notwithstanding these prophylactic measures against further posterior rotation, this should occur, the Simpson or the axis-traction forceps may be applied, and used mainly to lift the head from the over-distended perineum, and not as a tractor. In the difficult cases in which instrumental delivery is required from the beginning, the occiput becoming engaged in the posterior position, the head must be dragged down to the vulvar orifice and the outward traction continued until the brow become firmly fixed under the symphysis; the forceps must then be grasped in the right hand and the head lifted steadily upward until the occiput be almost on the point of emerging from the vulvar orifice, when the handles must be carried downward over the perineum, the face appearing from beneath the symphysis. In

rare cases excellent results may be obtained by converting the abnormal position into a face presentation with the chin anterior.

(*b*) *Transverse Engagement of the Occiput.*—In certain cases of deformed pelvis in which the main constriction has taken place in the conjugate diameter, the head is caused to assume a transverse position as it enters the superior strait: in such a position the smallest diameter of the fetal skull—the bitemporal, which measures but 8 cm. (3.1496 in.)—is made to correspond to the contracted pelvic conjugate diameter by the partial extension of the head that occurs in these cases. *Diagnosis.*—Vaginal examination will show the sagittal suture occupying a transverse direction in the pelvis with the posterior fontanel to one side—that corresponding to the fetal back—and the greater fontanel at the opposite extremity of the transverse diameter of the pelvis. The increase in the pelvic obliquity always noted in contracted pelvis produces an extreme lateral flexion of the skull upon the fetal body; as a consequence, there results a presentation of the anterior parietal bone, or even of the ear. The danger of this condition is that there has occurred a slight degree of extension of the head, and, in consequence, backward rotation of the occiput may follow a primary impingement of the brow upon the pelvic floor. The *treatment* consists in securing anterior rotation of the occiput if possible, or delivery by the forceps, version, or symphysiotomy, according to the degree of contraction that may be present. The application of forceps to the head lodged transversely at the superior strait is always a difficult procedure. It is impossible to secure a proper grip upon the head, the blades grasping it over the face and occiput. It may readily be seen that compression of the skull will result in a compensatory enlargement of its transverse diameters, whereby the mechanism will become an almost impossible one. Attempts at extreme rotation of the blades in order to apply them to the sides of the fetal

skull are unjustifiable on account of the imminent danger of perforation of the posterior uterine wall thereby engendered. Under such circumstances the right-hand blade should be rotated slightly forward: in this way the head is grasped on one side of the forehead and upon the opposite side of the occiput; the blades now will not lock with ease, and there is increased danger of producing a fracture of the skull; to prevent this, or too much compression of the head, a folded towel should be placed between the handles. Traction is then made, and as the head descends and rotates within the grasp of the forceps the latter may be removed and the vicious grip corrected.

(*c*) *Transverse Position of the Head at the Inferior Strait.*—A serious anomaly of vertex presentations results when, owing to certain irregularities of the pelvic or fetal outlines, descent of the head occurs without anterior rotation of the presenting portion taking place. Under these circumstances the head occupies the transverse diameter of the pelvic outlet. Maurice Muret[1] claims that this position may be primary or secondary. A *primary transverse position* at the outlet occurs in the simple flat pelvis (rachitic or non-rachitic) in double congenital dislocation of the hips, and in the generally equally contracted and flat pelvis. In the simple flat pelvis the bregma occupies the lower position, while in the flat and contracted pelvis the posterior fontanel is lower. The primary position may likewise occur in the funnel-shaped pelvis, and in a larger pelvis when an undersized head is rapidly driven through after a sudden rupture of the membranes. Most of these cases are primarily occipitoanterior presentations. A *secondary transverse position* at the outlet occurs in those cases in which there exist a large head and a broad occiput, the latter starting and remaining posteriorly until the pelvic floor is reached. Here sufficient force may be encountered to secure a partial rotation of the occiput into the transverse

[1] *Rev. méd. de la Suisse Rom.*, xiv. No. 1, 1894.

diameter of the outlet. The bregma usually occupies a lower position than the occiput in these cases. Again, this position may be reached secondarily in certain cases of flat pelvis large enough to allow the head to pass through the inlet in an oblique diameter with the occiput posteriorly, but so contracted below that complete anterior rotation cannot be accomplished. *Symptoms.*—The clinical course of these cases varies. At times the obstruction afforded to labor may result in an absolute cessation of the pains, and the head may remain stationary and impacted in its unusual position; if this be not speedily corrected, sloughing of the vaginal walls and fistulæ may result, and the child may perish from asphyxiation. Exceptionally, the pains may become so excessive as to drive the head through the bony outlet at the imminent peril of the perineal tissues, which are usually badly lacerated. At other times anterior rotation may occur, and usually rapidly, in the bony outlet, or even on the perineum, or posterior rotation may follow. Very rarely, the delivery may be spontaneous in the transverse position, especially when the pelvis is large, the head small, and there exists an old perineal laceration; still, it is possible for the head to be born transversely in flat and contracted pelves, provided it remain strongly flexed. The *prognosis* for both mother and child is unfavorable. A large percentage of the children are stillborn, either from compression of the brain-centers or from injury during delivery, and the mother is subjected to the risks of grave lacerations of the soft structures, sepsis, and exhaustion. The *treatment* is as follows: (1) *Postural and Expectant.*—The woman occupies a lateral decubitus, resting upon that side to which the occiput is directed. Anterior rotation may thus be favored, and this may be further supplemented by *Tarnier's manual method of rotation*—namely, by two fingers passed up behind the ear that is resting against the symphysis. This latter method is useless in cases of contracted pelvis. The expulsive forces may be increased

by the administration internally of stimulants or by the employment of Kristeller's method of uterine expression. (2) *Instrumental.*—These measures failing, the Simpson forceps may be applied in one of the oblique diameters of the pelvis, but *never in the anteroposterior* diameter. No efforts at forced rotation should be made. Gentle traction is required until the head reaches the muscular floor, when the instrument must be removed. Rotation may then be effected by *Muret's manual method,* which consists in pressure by two fingers upon the smaller fontanel (usually situated immediately above one of the sciatic tuberosities) and the projection formed by the union of the lambdoid and sagittal sutures, while two fingers of the left hand, introduced into the rectum, press the brow posteriorly. (3) *Operative* treatment is but rarely indicated. In the case of a funnel-shaped or contracted flat pelvis, if the child be living, symphysiotomy may be performed; in case of fetal death craniotomy is indicated.

(*d*) *Other Anomalies in the Mechanism of Vertex Presentations.*—In certain cases of contracted pelvis, or when there is a relaxed condition of the abdominal walls, there results a forward displacement of the gravid uterus, at times amounting to a true hernia. The method of correcting this anomaly, which may as long as it exists constitute an insuperable obstacle to the progress of labor, has already been described under the pathology of pregnancy (see page 394). A similar condition is an exaggerated tilting of the uterus to the right by the rectum. During the contractions of labor the fetal presentation will, under such circumstances, be driven against the left pelvic brim and wall, and all progress be arrested. The *treatment* consists in placing the woman upon the side toward which the womb is tilted, the fundus being lifted by means of a pad placed under her side. Delivery of the head in an oblique diameter is occasionally noted in cases of badly lacerated or much-relaxed perinei. The danger of such an anomaly is that there will follow a

still more extensive destruction of the maternal soft structures. *Excessive external rotation of the head* may occur in certain cases, and especially in occipitoposterior positions, due to an abnormal rotation of the shoulders within the pelvic canal. This may be produced in the following manner: The anterior shoulder catches upon the pelvic brim; the posterior shoulder is then driven down, and, striking the perineum, is rotated forward under the symphysis, thereby describing a semicircular movement; the liberated head is rapidly whirled in a corresponding direction in response to the extreme torsion of the neck.

(*e*) *Impacted Breech.*—By this term is meant that troublesome condition in which the pelvic extremity of the child will, in an ordinary breech presentation, become firmly lodged at the superior strait or in the pelvis, so that the expulsive efforts of the mother fail to impel the fetus through the parturient canal. There are two *varieties* of impacted breech: 1. That in which the fetal attitude is normal—with complete flexion of the thighs upon the abdomen and of the legs upon the thighs—but in which there exists a relative disproportion between the size of the breech and that of the pelvic inlet; impaction here occurs at or just within the superior strait; 2. That in which the fetal ellipse is altered in such a way as to constitute a wedge-shaped body with the base of the wedge above. This alteration is brought about by an extension of the legs, the thighs remaining fully flexed; the feet are thus brought in apposition with the fetal head, and the combined bulk cannot engage in the superior strait. The breech in this variety has generally well descended into the pelvic cavity. *Symptoms of Impacted Breech.*—The symptoms of this anomaly are extreme delay in the progress of labor; failure of the presenting part to advance; an increase in the maternal pulse-rate, the heart-beats becoming rapid and feeble; and an increasing degree of exhaustion. There may finally ensue a slight elevation of temperature. *Physical Signs.—Vagi-*

nal examination reveals in the first variety a high position of the presenting part, which is very firmly fixed at the superior strait; the extremities cannot, as a rule, be palpated. In the second variety the breech will be found lower down in the pelvic canal, and the thighs may be felt extending upward along the fetal abdomen. *Abdominal palpation* in the latter case may reveal the extended feet in the fundus uteri in close approximation to the fetal head. *Fetal Diameters Involved.*—These are the same as in unobstructed breech presentations. *Treatment.*—There are several methods of treatment in vogue for the management of these cases, but in every instance it is preferable to place the woman under the influence of an anesthetic. 1. *Podalic Version.*—In the first variety, in which there has been failure of the part to engage in the superior strait, the hand of the operator corresponding to the fetal abdomen may be introduced into the uterine cavity, a foot grasped and drawn down, and the pelvic extremity thus caused to engage. 2. *Decomposition of the Breech* (*Goodell's Method.*)—This is a method especially applicable to the second variety of impacted breech. It consists in dragging down one or both of the extended limbs, and by traction causing an engagement of the breech; the fetus may then be rapidly delivered by the ordinary methods. 3. *The Application of the Forceps.*—When Goodell's method cannot be put into operation, it then becomes imperative to deliver by instrumental means: the special breech-forceps or the axis-traction forceps are peculiarly serviceable in these cases. The grasp is taken over the great trochanters, and, in order to avoid fracture of the pelvic bones or perforation of the abdominal walls, the handles must not be strongly compressed. If accurately applied and proper watchfulness be observed, slipping of the instrument may be avoided. The expulsion of the fetus may be facilitated by pressure from above. 4. *Traction on the Breech.*—There are several methods of performing this, as follows: (*a*) *Traction upon the Groin.*—Frequently the

simple maneuver of hooking the index finger over the groin and making traction during the pains will suffice; engagement of the part may thus be effected and internal rotation secured; as soon as sufficient descent has been secured, the breech may be "decomposed" and delivery accomplished according to Goodell's method. Traction upon the groin may also be made by the fillet or by the blunt hook. The *fillet* is a strip of ordinary bandage, the extremities of which are passed around the lumbar region of the fetus from behind forward, and are brought down between the thighs in front of the external genitals; when drawn taut the bandage becomes accurately fitted to the fetal back and a powerful grasp is taken upon the breech. The main objection to this method is the extreme difficulty experienced in applying the bandage. The *blunt hook* is the familiar upper extremity of the Hodge and other forceps. It is slipped around the groin from without inward and traction made. It is a dangerous instrument, and not infrequently results in perforation of the groin or in fracture or dislocation of the thigh: it should only be employed as a *dernier ressort* or after fetal death. (*b*) *Traction upon the Pelvic Bones.*—This is a very difficult and almost impracticable method of manual delivery of an impacted breech. The hand is introduced well up along the fetal back; the index and little fingers are hooked over the iliac crests on either side; the middle and ring fingers are made to press firmly upon the spine, while the thumb grasps the body anteriorly; traction is then exerted, but owing to the imperfect grip but little power can be exercised. 5. *Pinard's Method.*—This is a manual method in which the index finger is inserted over the posterior surface of the thigh, which is then pressed upward and outward, thereby causing a certain amount of flexion at the knee. By this maneuver the heel is brought down within reach, when it may be grasped and the breech delivered. 6. *Embryotomy* is very rarely indicated; it is applicable only in case of fetal death.

(*f*) *Extension of the Arms in Breech Presentations.*—During the manipulations necessary for the reduction of an impacted breech; or in consequence of too violent traction upon the fetal body in an uncomplicated breech presentation; or, rarely, without such interference on the part of the accoucheur, there may occur an upward displacement of the arms, so that they lie extended at full length by the sides of the fetal head. Before the latter can be delivered the arms must be freed from their unnatural position. The method of accomplishing this is as follows: The posterior arm—that nearest the hollow of the sacrum when the occiput has rotated under the symphysis, usually the right—is the first to be released, because of the greater room afforded by the concavity of the sacrum. The fetal legs are grasped with the left hand just above the malleoli, the middle finger being placed immediately above the two internal, and the ring and index fingers above the external malleoli; the fetal body is then carried forcibly upward and outward over the right maternal thigh; this causes the right shoulder of the fetus to descend well into the pelvic canal; the index and middle fingers of the right hand are then passed up to the right scapula and along the dorsal surface of the arm past the elbow; the latter, still unflexed, is pried forward into the hollow of the sacrum, so that the arm holds a position directly in front of the fetal face; flexion of the arm is then secured by passing the finger through the elbow-joint and making steady downward traction until the latter appear at the vulvar orifice; then by the process of extension the forearm may be delivered. The body of the child is then grasped by the right hand in the same manner as before, and carried well upward and over the left maternal thigh, while the fingers of the left hand repeat the maneuver already described, and the anterior arm is delivered. The head must then be delivered by one of the usual methods. The following rule may be formulated for the delivery of the extended arms in breech presentations: The arms must

always be carried toward the anterior or abdominal surface of the fetus, and that arm must be first delivered which occupies originally a position nearest the anterior fetal surface.

(*g*) *Nuchal or Dorsal Position of the Arm.*—Occasionally, during traction upon the fetal body after version or in the delivery of a breech presentation, the anterior arm is not only displaced upward, but is at the same time carried backward by a forward rotation of the body; it thus comes to occupy a flexed position across the occipital region of the head or is lodged at the nape of the neck (Fig. 105). *Treatment.*—There are two possible methods of treating this condition: (1) It may be possible to correct the malposition by gently rotating the body in the opposite direction from that productive of the displacement. (2) The better method is to carry the fetal body downward over the edge of the bed, at the same time passing the finger under the symphysis and up the child's back until the elbow is reached; into this the finger is hooked and the arm swept outward and in front of the fetal face, where it is to be delivered as under the ordinary circumstances. In rare cases, when the arm is firmly fixed in this unnatural position, fracture may be justifiable in order to disengage it.

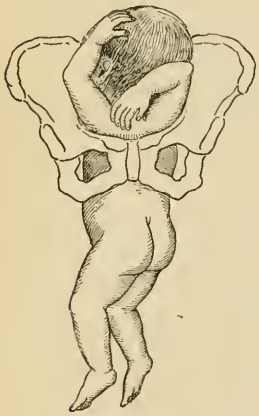

FIG. 105.—Dorsal displacement of arm.

A similar displacement of the arm may occur, though with much less frequency, in cephalic presentations. The arm becomes extended by the side of the head with the forearm flexed and carried back of the occiput, the hand resting in the hollow between the scapulæ. This constitutes an absolute obstacle to the progress of labor. It can be discovered only by digital exploration. *Treatment.*—

As in the preceding instance, two methods of treatment are suggested: (1) It may be possible to cause extension of the arm by sweeping the forearm over the occiput, thereby changing the presentation into the complex one of both hand and head. (2) By far the preferable method is the immediate performance of podalic version and delivery of the fetus as in the case of a breech presentation.

(*h*) *Backward Rotation of the Occiput in Breech Presentations.*—This is a very rare complication of a breech presentation in which the occiput fails to assume a position under the symphysis pubis, but, instead, rotates into the hollow of the sacrum with the face directed toward the pubis. This results from a failure of the after-coming head to undergo the normal slight degree of extension on entering the pelvic inlet; remaining flexed, the brow first strikes the pelvic floor and advances under the symphysis pubis. In the delivery of the head under these circumstances two positions may be encountered: (1) The head may remain firmly flexed, the nape of the neck becoming fixed in front of the perineum; in this case the treatment consists in resting the fetal back upon the left arm while the fingers of the right hand are passed over the shoulder, flexion being secured by pressure upon the chin; the fetal body is then carried downward over the side of the bed, the chin, face, brow, and anterior fontanel appearing in rapid succession from under the symphysis pubis. Should it become necessary to apply forceps with the child in this position, the body must be raised and supported by an assistant while the forceps are applied to the head from beneath; by elevating the handles the occiput will be made to sink into the hollow of the sacrum. (2) In rarer cases an extension of the head occurs, so that the face is directed upward, and as traction is made upon the fetal body the protruding chin is caught by the inner and upper surfaces of the symphysis and the delivery of the head is arrested. *Treatment* now consists in carrying the fetal body upward over the maternal ab-

domen, while pressure is exerted with the disengaged hand upon the head through the abdominal wall immediately above the symphysis pubis; as this is done the external occipital protuberance, the posterior fontanel, the vault of the cranium, and, finally, the face, will emerge from under the perineum. *Management of the Arms in Backward Rotation of the Occiput.*—If the arms remain flexed upon the thorax, they can be readily reached under the symphysis and delivered by the process of extension; should they become extended by the sides of the head, the lack of space under the symphysis pubis will not permit an anterior sweep of the arm unless the fetus be considerably under size. Again are two methods of treatment suggested: (1) Generally, under these circumstances, the hand should be introduced into the vagina and the bisacromial diameter of the thorax caused to assume an anteroposterior position, so as to bring one arm to the rear, when it may be delivered in the ordinary method; the remaining arm may then be swept over the face and delivered as before. (2) *Michaelis' method* consists in passing the hand back of the child until the elbow is reached; this is then grasped and drawn downward and backward, after which the forearm is pushed down over the thorax and caused to appear at the vulva; this maneuver may be repeated upon the opposite side.

(*i*) *Malpresentations due to Imperfect Flexion of the Head.*—Any deviation of the fetal head from its normal position of extreme flexion upon the thorax alters the form of the fetal ellipse and results in various malpresentations. According to the degree of extension that occurs will depend the variety of the presentation that will be produced. If there be but a slight reduction of the normal flexion, the bregma presents; if the head occupy a position midway between full flexion and full extension, there results a presentation of the brow, while if it become completely extended, the face engages in the superior strait.

Presentation of the Bregma.—This is a very rare cephalic

presentation in which the head is set squarely upon the shoulders, sufficient extension having occurred to bring its longitudinal axis into a right angle with that of the body. *Varieties.*—It is possible for this presentation to occupy any of the four cardinal positions, with the frontal portion of the head directed to the right or left and anteriorly or posteriorly. The *diagnosis* is not difficult. *Vaginal examination* reveals the bregma at the center of the plane of the superior strait, with the sagittal and frontal sutures extending therefrom in one or the other oblique pelvic diameter; the supraorbital ridges may be felt far up and anteriorly or posteriorly in an oblique diameter according to the position of the brow. *Fetal Diameters Involved.*—In such a presentation the occipitofrontal (11¾ cm., or 4.6259 in.) and biparietal (9¼ cm., or 3.6417 in.) diameters are brought into relationship with the diameters of the superior strait. *Steps of the Mechanism.*—This presentation may present the following mechanism: 1. Engagement of the head in the superior strait; 2. Slow and difficult descent of the head to the pelvic floor; 3. Anterior rotation of the brow, accomplished only with great difficulty and with much damage to the maternal soft parts. Owing to the extensive dilatation of the upper portion of the vagina by the large fetal diameters the perineum begins to rupture long before the head has descended sufficiently to touch it, and this laceration not only involves the perineal body itself, but extends through the sphincter ani and for an inch or two up the rectovaginal septum; 4. Birth of the head by propulsion and partial extension, the parts emerging as in face presentation; 5. Delivery of the shoulders and remaining portion of the body in the normal manner. *Treatment.*—Should the diagnosis of the abnormal presentation be made before the beginning of labor, or, at least, before engagement of the part, cephalic version must at once be performed according to *Baudelocque's method.* This consists in introducing one hand—that corresponding to the fetal

back—into the vagina, the woman being anesthetized and the membranes ruptured; the thumb is placed upon the frontal region of the head, while the remaining fingers are passed over the external occipital protuberance; by a "ratchet movement" the occiput is caused to descend while the anterior portion of the head is displaced upward; at the same time the head is pushed slightly upward into the uterine cavity, counterpressure being exerted upon the fundus uteri. If the head be well engaged, the forceps must be applied and anterior rotation accomplished, care being taken to protect the perineum as far as possible.

Presentation of the Brow.—This is probably, next to that of the bregma, the rarest of cephalic presentations, occurring in about ¼ of 1 per cent. of all cases. In it the head occupies a position upon the shoulders midway between complete flexion and complete extension. *Etiology.*—This presentation may be produced in two distinct ways: In the *first* place, anything that will prevent a perfect flexion of the head upon the thorax will so alter the relations of the arms of the lever (see the etiology of vertex presentations) that the bulk of the head will lie slightly behind the longitudinal axis of the body; consequently, a slight excess of the resistant force will be directed against the posterior portion of the head, and the chin will leave the thorax; in other words, there is almost a balancing between the amount of force directed against the anterior and posterior arms of the lever, the latter being but slightly longer than the former. Among the causes that will prevent a complete flexion of the head may be mentioned enlargement of the fetal thorax, as by an intrathoracic tumor; the presence of certain anterior cervical tumors, as an hypertrophied thymus-gland; tonic contraction of the posterior cervical muscles; according to some authorities, a rigid contraction of the cervix around the neck, thereby displacing upward the chin, and an excessive coiling of the funis around the neck, may result in the same anomaly of flexion.

Secondly, anything that will favor extension of the fetal head will conduce to this disturbance of perfect flexion. Among such causes may be mentioned under-size with consequent undue mobility of the fetus; any tumor of the fetal back or posterior cervical region, as one of the forms of meningocele or spina bifida; an obliquity of the child *in utero* or of the uterus itself (Duncan), so that the fetal ellipse lies obliquely with the abdominal surface directed downward, as may result from various forms of pelvic deformity, the flat rachitic pelvis (*e. g.*), the center of gravity of the fetal body being so displaced as to shorten the anterior arm of the lever; sudden evacuation of the liquor amnii; an abnormally elongated occipital portion of the fetal head (dolichocephalic skull—Hecker); catching of the occiput above the pelvic brim; and an over-distention of the maternal bladder, causing a retrodisplacement of the fetal body. Finally, a brow presentation may result from any condition that will interfere with a normal engagement of the head, as overgrowth of the child or some exostosis or other tumor occluding the pelvic inlet.

Varieties.—There are four possible positions of the brow—namely, with the frontal bone situated to the left or the right and anteriorly or posteriorly. *Diagnosis.*—The diagnostic points of these positions of a brow presentation are as follows: (1) The brow anterior and to the left, *left fronto-anterior;* symbol, L. F. A. (Fig. 106). *Vaginal examination* reveals the brow directed anteriorly toward the left acetabulum; above may be felt the large fontanel with the frontal suture running downward and backward in the plane of the right oblique pelvic diameter; posteriorly may be felt the supraorbital ridges and the depressions of the eyes. The chin lies far up to the rear, beyond reach, and directed toward the right sacroiliac synchondrosis. *Abdominal palpation* reveals the fetal back to the left side, with the extremities above and directed toward the right side. The head is inclined partially backward toward the fetal

back, hence palpation will reveal a groove between the head and back, closely resembling but not so deep as that found in a face presentation. The shoulders lie in the left oblique

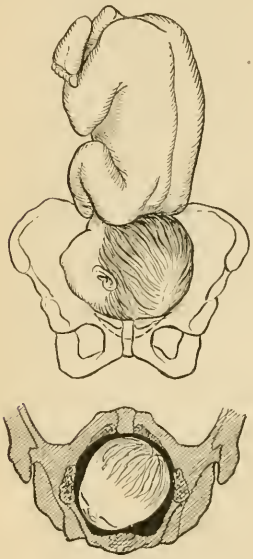

FIG. 106.—Brow presentation, L. F. A.

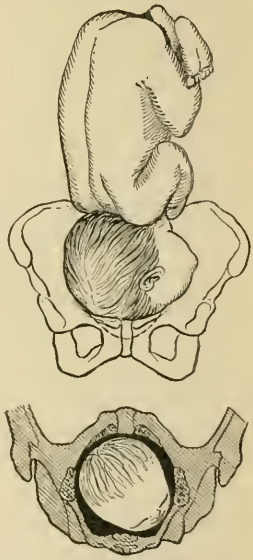

FIG. 107.—Brow presentation, R. F. A.

diameter, the right anterior, and directed toward the right acetabulum, while the left shoulder lies toward the left sacroiliac synchondrosis. The fetal heart-sounds may be heard on the left side below the umbilicus. They may be detected with about equal distinctness upon either surface of the fetal body.

(2) The brow anterior and to the right, *right frontoanterior;* symbol, R. F. A. (Fig. 107). *Vaginal examination* reveals the brow directed anteriorly toward the right acetabulum, with the bregma far up above and the frontal suture extending in the line of the left oblique pelvic diameter; posteriorly, toward the left sacroiliac synchondrosis, are the supraorbital ridges, with the chin far up beyond reach. *Ab-*

dominal palpation reveals the fetal back to the right side, with the extremities above and to the left. The shoulders lie in the right oblique diameter, the left anterior, and directed toward the left acetabulum, while the right shoulder lies toward the right sacroiliac synchondrosis. The fetal heart-sounds may be heard on the right side below the umbilicus.

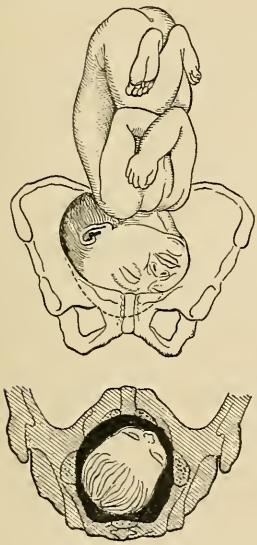

FIG. 108.—Brow presentation, R. F. P.

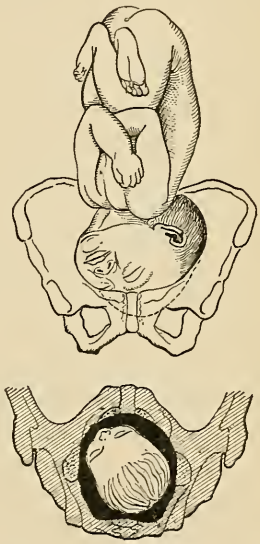

FIG. 109.—Brow presentation, L. F. P.

(3) The brow posterior and to the right, *right frontoposterior;* symbol, R. F. P. (Fig. 108). *Vaginal examination* reveals the brow directed posteriorly toward the right sacroiliac synchondrosis, with the bregma above and the frontal suture extending in the line of the right oblique pelvic diameter; anteriorly toward the left acetabulum are the supraorbital ridges, with the chin above beyond reach. *Abdominal palpation* reveals the fetal back to the right side, with the extremities above and to the left. The shoulders lie in the left oblique diameter, the left anterior, and directed toward

the right acetabulum, while the right shoulder lies toward the left sacroiliac synchondrosis. The fetal heart-sounds may be heard on the right side below the umbilicus.

(4) The brow posterior and to the left, *left frontoposterior;* symbol, L. F. P. (Fig. 109). *Vaginal examination* reveals the brow directed posteriorly toward the left sacroiliac synchondrosis, with the bregma above and the frontal suture extending in the line of the left oblique pelvic diameter; anteriorly toward the right acetabulum are the supraorbital ridges, with the chin above and beyond reach. *Abdominal palpation* reveals the fetal back to the left side, with the extremities above and to the right. The shoulders lie in the right oblique diameter, the right anterior, and directed toward the left acetabulum, while the left shoulder lies toward the right sacroiliac synchondrosis. The fetal heart-sounds may be heard on the left side below the umbilicus.

Diagnosis when the Head is Above or At the Pelvic Brim.—It is very common in brow presentations in which engagement of the head has not occurred, to find the frontal suture occupying the transverse diameter of the superior strait, with the brow to the right or left and the supraorbital ridges and eyes at the opposite extremity of this diameter. *Fetal Diameters Involved.*—In the presentation of the brow the greatest diameter of the fetal head—the occipitomental (13½ cm., or 5.3150 in.)—offers at the plane of the superior strait. It is obvious that under the most favorable circumstances—namely, with the chin anterior, the head small, and the pelvis roomy—the labor must be protracted, while, should the chin occupy a posterior position or the pelvis be contracted even to a minor degree, a natural delivery is impossible from inability of the presenting portion to reach the pelvic floor and thus rotate anteriorly. *Steps of the Mechanism.*—In the anterior positions of the chin (R. F. P. and L. F. P.) the following are the possible stages in the delivery of the head: 1. *Preliminary flexion and moulding.* On account of the unfavorable presentation

of the head this stage of the mechanism is much protracted, and, indeed, often unaccomplished. It is not a rare occurrence for the labor-pains to have persisted for twenty-four or thirty-six hours without engagement of the part. In some cases, however, under the influence of the uterine contractions, the fetal head will be so altered in shape by the excessive moulding that its engagement becomes possible. 2. *Slow descent of the brow to the pelvic floor*, accomplished through the agency of the forcible uterine contractions and with much suffering to the mother. 3. *Anterior rotation of the chin* (which first strikes the pelvic floor anteriorly) *under the symphysis:* the chin rotates from left to right in R. F. P., and from right to left in L. F. P. presentations; the occiput now lies in the hollow of the sacrum, while the inferior maxilla rests upon the symphysis. 4. *Propulsion and delivery of the head* by a process of partial flexion followed by a counter-movement of extension. For this to take place the neck and body of the child must begin to descend in the pelvic canal before the head has emerged from the vulvar orifice; hence ensues increased retardation of labor with added risk of perineal and vaginal lacerations. The order of delivery of the cephalic portions is as follows: (*a*) The occiput emerges from under the perineum as the flexion of the head is increased, (*b*) the head extends as the perineum retracts, and the brow, the upper maxilla, the mouth, and the chin emerge in succession from under the symphysis pubis. 5. *Restitution*, as in the case of the vertex, the head rotating from right to left in R. F. P., and from left to right in L. F. P. presentations. 6. *External rotation* of the head due to anterior rotation of the shoulders (from right to left in R. F. P., and from left to right in L. F. P. presentations). 7. Delivery of the arms and body as in normal vertex cases. *Prognosis of Brow Presentations.*—The prognosis at the best is doubtful for the mother and grave for the fetus. One child in three will perish, while the maternal mortality is about 10 per cent The *causes of maternal death* are exhaus-

tion; sepsis from operative manipulations and laceration of the parturient canal; and shock. *Fetal death* is produced by fatal compression of the skull, with asphyxia; the accidents of labor, as prolapse of the cord (a common complication of brow presentation); and some grave obstetric operation (difficult forceps-application, craniotomy). It must be remembered, however, that not infrequently a presentation primarily of the brow may spontaneously be converted into that of the face or of the vertex; in fact, every case of face presentation was at one stage of its development one of the brow. Unfortunately, this spontaneous version cannot be depended upon. The configuration of the fetal head after a prolonged labor with a brow presentation is quite typical. There is an immense caput succedaneum occupying the entire frontal region of the head, and of such a size as to completely overshadow the face; the eyes are swollen and the lids closed and highly edematous; the mentofrontal and occipitofrontal diameters are vastly increased in length. This change in the shape of the head is produced by compression of the posterior portion of the skull between the fetal back and the maternal symphysis pubis.

Treatment of Brow Presentation.—So serious are the consequences of this mechanism of labor, even when the most favorable circumstances are offered, that every effort of the accoucheur must be directed toward its alteration into one more favorable for both mother and child: especially fortunate is it if the case be diagnosed before labor or before actual engagement of the presenting part have occurred, for then can be instituted measures attended with but comparatively little risk. The management of a brow presentation may be stated as follows: 1. *Postural treatment*, the woman being placed upon that side toward which the face is directed in order to secure perfect flexion of the fetal head upon the body. This method is of service only before the onset of labor. 2. *The performance of cephalic version.* Before engagement of the head has occurred it is generally

a simple matter to transform a brow presentation into one of the vertex. There are two methods by which this may be accomplished: (*a*) The woman being anesthetized, version may be performed by external manipulation alone, downward pressure being exerted upon the occiput to secure perfect flexion of the head, while the body of the child is inclined in the direction toward which the fetal face is directed. (*b*) This failing, Baudelocque's method, as described in the management of presentation of the bregma, will generally succeed. This variety of cephalic version being impracticable should the brow be posterior and the chin anterior, an effort may be made to convert the presentation into one of the face. This is performed by reversing the "ratchet-movement" of Baudelocque's method, the occiput being displaced upward, while downward traction is made upon the chin and mouth, if need be a finger being inserted into the latter in order to secure a firm hold. The body of the child should at the same time be carried in the direction toward which the fetal back is directed to secure complete extension of the head. 3. *The performance of podalic version.* Efforts at cephalic version proving futile, the next aim should be to secure a presentation of the pelvic extremity of the fetal ellipse. To accomplish this, the hand should be introduced into the uterine cavity that, held midway between pronation and supination, will correspond to the fetal abdomen; one or both feet may be grasped and dragged downward, the disengaged hand at the same time pushing upward through the maternal abdominal surface the cephalic extremity of the fetus. This procedure is contraindicated by engagement of the brow in the superior strait or pelvic canal and by complete escape of the liquor amnii some hours previously; under either of these circumstances the performance of podalic version would jeopardize the integrity of the uterine walls. 4. *Application of the forceps.* Forceps are to be employed as a tractor in those cases only in which the brow is posterior and the chin anterior; they

must never be so employed in frontoanterior positions, but merely as a rotator. 5. Should it be impossible in these cases to secure anterior rotation of the chin, and the fetus still be living, symphysiotomy may be performed, and the child then delivered by forceps. 6. *Craniotomy* is indicated when all other methods have failed and the child is dead.

Craniotomy and Cranioclasm.—Craniotomy is an obstetric operation—a variety of embryotomy—in which the size of the fetal head is diminished by cutting or crushing the bones after evacuation of the cranial contents, when delivery of the fetus by other means is impossible. The operation is an easy one, requiring not more than fifteen or twenty minutes for its performance. It should never be done, however, without professional consultation. *Indications for the Operation.*—Craniotomy is indicated when the following conditions exist: 1. Position of the head above the superior strait when other operative procedures are inexpedient. 2. Fetal death, as evidenced by absence of the heart-beat or absence of pulsation in the funis for at least ten minutes. A living child can generally be delivered by some other obstetric operation not necessitating the destruction of its life; fetal life should therefore be regarded as a contraindication to the performance of craniotomy. 3. Occasionally an over-size of the fetal head from intracranial disease, as hydrocephalus. In a case of this nature, if the condition be positively diagnosed, the destruction of fetal life may not be objectionable. This involves a serious question, however, and it should be remembered that aseptic puncture of the fontanel with evacuation of the watery accumulation within the skull will considerably diminish the size of the head without necessarily proving fatal to the child. *Instruments Required.*—The necessary instruments include a volsella forceps, a perforator, a cephalotribe or basiotribe, a craniotractor or cranioclast, a vaginal syringe (the Household), and a hard-rubber catheter. There should be prepared a quantity of mercuric chlorid

solution (1 : 2000) and of carbolized water (1 : 40). The *perforator* or *transforator* is a scissor-like instrument with a cutting edge upon the external margins of the blade, and a sharp point; a shoulder at the upper extremity of the blade prevents too deep penetration of the instrument, and by approximation of the handles of the instrument the blades are separated. Those most commonly employed are Blot's perforator (which is so constructed that it cannot injure the maternal tissues) and the Smellie or the Hodge scissors. The *cephalotribe* (*basiotribe*) or *head-crusher* is a heavy two-bladed instrument employed to crush or compress the fetal skull after evacuation of the cranial contents; a blade is applied to either side of the cranial vault, and the handles are then approximated by means of a powerful screw; if properly applied, the rigid base of the fetal skull may by this instrument be crushed and all obstruction to fetal delivery removed. The instrument serves equally as well for the purpose of traction after compression. Those most commonly used are Karl Braun's, Braxton Hicks' (Fig. 110), Tarnier's, and Lusk's. The *craniotractor*

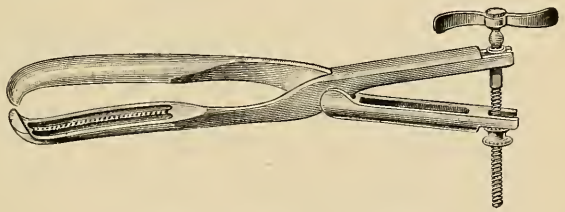

Fig. 110.—Cephalotribe of Hicks.

(*cranioclast*) or *head-seizer* is an instrument intended to grasp a portion of the crushed skull and maintain such a hold that traction may be made and the head delivered. It consists of two blades, one of which is introduced within the cranial cavity through the perforation made in evacuating the cranial contents; the other blade grasps the head externally; by pressure upon the handles not only is a firm

grasp secured, but injury to the maternal tissues is prevented, the exposed blade sinking into the tissues of the skull: there is but little danger of slipping, and should a portion of the skull be torn away, another portion may be grasped and the traction completed. The most common craniotractors employed are those of Karl Braun and Hirst. It is essential for proper and easy manipulation that the instrument should possess not only the cephalic, but the pelvic curve as well.

Steps of the Operation.—1. The patient must be etherized and placed in the *lithotomy position*, with the hips extending beyond the edge of the bed; the bladder and rectum must be thoroughly emptied. 2. *Vaginal asepsis* must be secured by means of a douche of warm mercuric-chlorid solution (1 : 2000). 3. *Fixation of the Head and Scalp.*—This may be accomplished by an assistant steadying the head from above through the abdominal wall, while with a volsella forceps the scalp is grasped close to the point of operation, and slight outward traction made. 4. *Cranial Perforation* (*transforation*).—The index finger of the left hand must be passed up to the cervix and a fontanel or suture located; in case of a face presentation, perforation must be made through the most accessible orbit: it occasionally happens that none of these soft structures of the skull are within reach, as in lateral deviation of the head, and then it becomes necessary to perforate a bony plate, as one of the parietal bones; in such an emergency extreme watchfulness is necessary to avoid slipping of the perforator, with consequent injury to the uterus or other maternal structure. According to Lusk, the instrument is less prone to slip if it be kept close to the symphysis pubis. 5. *Enlargement of the perforation*, accomplished by opening the blades (by approximation of the handles), the instrument at the same time being rotated from side to side. 6. *Disorganization of the Brain-mass.*—The perforator is passed up into the cerebral tissues and moved freely about in all directions in

order to destroy the continuity of the brain-mass; special care must be observed to destroy the tissue at the base of the skull and thus ensure fetal death. 7. *Decerebration* (*excerebration*), by intracranial injections of warm carbolized water. 8. *Crushing of the Skull; Cephalotripsy* (*Basiotripsy*).—The blades of the cephalotribe are applied in the same manner as those of the obstetric forceps, the left first, the head at the same time being steadied by an assistant, who exerts downward pressure through the abdominal walls.

FIG. 111.—Tarnier's basiotribe in action: the perforator is in place, as is also the first blade.

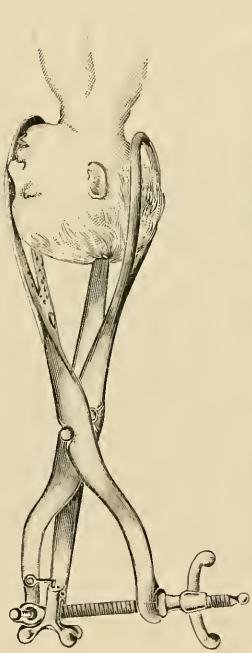

FIG. 112.—The first blade of the basiotribe has crushed the occiput, and the second blade is applied.

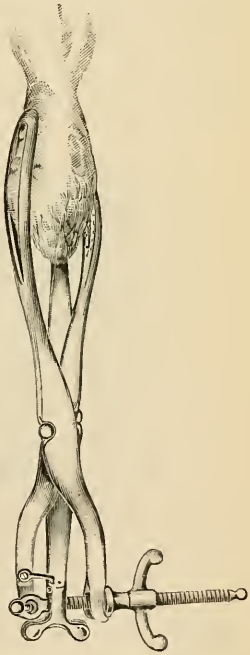

FIG. 113.—The second blade of the basiotribe has crushed the sinciput.

One of the blades, depending upon the pelvic diameter in which the head is resting, must be rotated upward and the instrument locked. Compression to the desired amount

may be slowly made and the head delivered (Figs. 111–113). Very often the operator will find that after evacuation of the cranial contents the head will collapse to such an extent that it may be delivered by the craniotractor, crushing being rendered unnecessary. The eighth step of the operation, then, is *extraction of the head by the craniotractor.* One blade of this instrument is introduced through the cranial perforation and passed upward until it grasp the base of the skull; the outer blade is then applied directly over the ear or the face, and steady traction exerted, the vagina being guarded from injury by the fingers of the left hand. In some cases of great difficulty comminution of the skull becomes necessary, portions of the cranial bones being broken off by the cra-

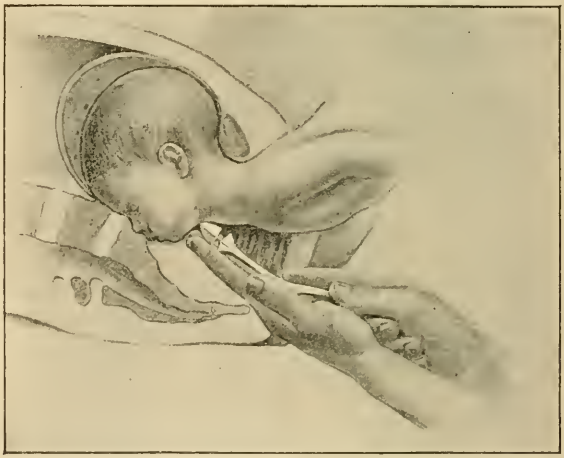

Fig. 114.—Craniotomy on the after-coming head; one method of perforating (Dickinson).

niotractor. When this is done the utmost care is required to avoid laceration of the maternal soft parts by the sharp spiculæ of bone. 9. *Extraction of the trunk*, either manually or by the craniotractor.

Perforation of the After-coming Head.—Occasionally, in breech presentations complicated by hydrocephalus or in

those cases of contracted pelvis in which an unwarranted version has been performed, with ultimate inability to deliver the after-coming head, it becomes necessary to resort to craniotomy (Fig. 114). The operation in such a case is generally unattended with difficulty, the steps being as follows: 1. An assistant grasps the fetal body and carries it upward and over the maternal abdomen. 2. *Perforation.*—This may be accomplished in one of two ways according to the position of the occiput. When the latter is anterior under the symphysis pubis, the perforator may be introduced through the anterior portion of the neck and the hard palate; if the occiput occupy a posterior position, an incision may be made through the skin at the nape of the neck and the perforator entered to one or the other side of the foramen magnum, or in other instances back of the ear.

Other Methods of Craniotomy.—1. *Basilysis.*—This is a rarely-employed form of craniotomy in which the base of the skull is broken up by means of a heavy screw-shaped instrument introduced in the vicinity of the sphenoid bone. The operation is attended with considerable difficulty and danger—hence its disuse. 2. *Cephalotomy or Lamination.*—This consists in the removal of the head in portions or slices; it is likewise a rarely-employed method of craniotomy. The size of the head may be diminished by excision of a wedge-shaped section of the skull, or the entire skull may be halved and removed piecemeal. The operation is in no way superior to the generally adopted method of perforation and crushing.

Presentation of the Face.—Face presentation is by no means a very rare complication of labor: its frequency is stated at one-half of 1 per cent., or about twice that of the brow. The head occupies the position of complete extension, the occipital portion of the skull being in close contact with the shoulders. *Etiology.*—This condition is induced by a disturbance of the relationship existing between the long axes of the body and head, so that the larger portion

of the latter lies behind, rather than anterior to, the spinal column; as a consequence the head as it engages in labor is extended instead of undergoing the normal process of flexion. The factors productive of this abnormal relationship are precisely the same as give rise to a presentation of the brow, acting, however, to a more absolute degree. The very generally accepted view is that this change occurs after the actual initiation of labor, but before engagement of the head in the superior strait. *Varieties.*—As for the other presentations, there are four possible positions for the face to assume—namely, with the most dependent portion, the chin, directed anteriorly or posteriorly and to the right or the left.

Diagnosis.—(1) The chin anterior and to the left, *left-mentoanterior;* symbol, L. M. A. (Fig. 115). This position

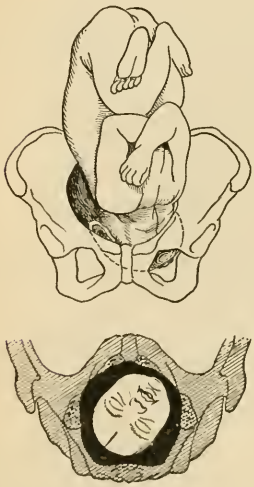

FIG. 115.—Face presentation, L. M. A.

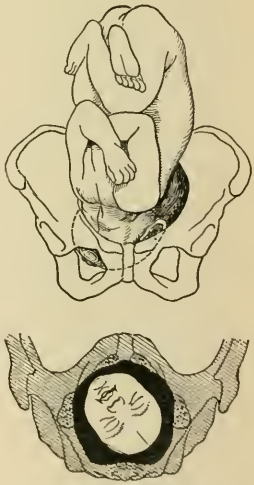

FIG. 116.—Face presentation, R. M. A.

is the second in order of frequency, owing to the right obliquity of the pelvis which is common to this presentation. *Vaginal examination* reveals a flattening of the vaginal vault with a high situation of the facial features—the orbits,

malar processes, nose (the nostrils indicate the side of the pelvis toward which the chin is directed), and the mouth with its alveolar processes—the chin being directed anteriorly and to the left acetabulum, and the hard rounded brow and frontal suture occupying the opposite extremity of the right oblique pelvic diameter toward the right sacroiliac synchondrosis. No fontanels can be detected. The membranes project well down into the vagina. *Abdominal palpation* reveals the fetal back directed posteriorly and to the right side, with a firm, hard, round mass—the cranial vault—just below, the two being separated by a characteristic deep groove; upon the opposite side of the abdomen, just above the pelvic brim, may be detected a soft body corresponding to the fetal neck and thorax. The shoulders lie in the left oblique diameter, the left anterior and directed toward the right acetabulum, while the right shoulder lies toward the left sacroiliac synchondrosis. The breech generally occupies a position upon the same side of the abdomen as the cranial vault, while the extremities are directed toward the left side of the maternal abdomen. The fetal heart-sounds may be best heard below the umbilicus and over the anterior surface of the fetal body—that is, on the left side of the maternal abdomen; they cannot be detected over the dorsum of the fetus, in strong contradistinction to a vertex presentation, in which the heart-sounds cannot be heard at all, or only indistinctly, over the anterior surface, but are quite distinct over the posterior aspect of the fetus.

(2) The chin anterior and to the right, *right mentoanterior;* symbol, R. M. A. (Fig. 116).—This is the third position in order of frequency. *Vaginal examination* reveals the chin directed anteriorly toward the right acetabulum, with the brow posterior toward the left sacroiliac synchondrosis and the frontal suture corresponding to the left oblique pelvic diameter. *Abdominal palpation* reveals the fetal back directed posteriorly and to the left side, with the groove between the occiput and fetal dorsum below, just

above the pelvic brim; the breech is above to the left side, with the extremities directed toward the maternal right side. The shoulders lie in the right oblique diameter, the right anterior and directed toward the left acetabulum, while the left shoulder lies toward the right sacroiliac synchondrosis. The fetal heart-sounds may be heard best below the umbilicus upon the right side of the abdomen.

(3) The chin posterior and to the right, *right mento-posterior;* symbol, R. M. P. (Fig. 117).—This is the most

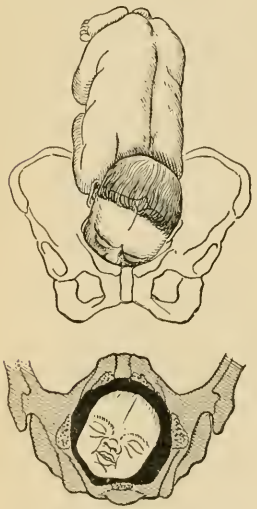

Fig. 117.—Face presentation, R. M. P.

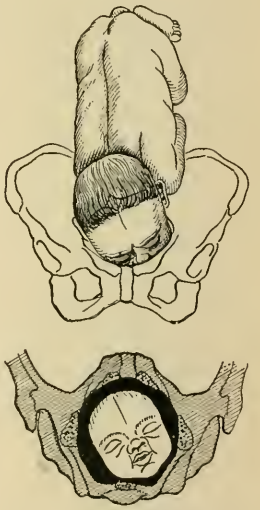

Fig. 118.—Face presentation, L. M. P.

common position of face presentation: the preponderance of R. M. P. and L. M. A. positions may be explained by the right obliquity of the uterus. *Vaginal examination* reveals the chin directed posteriorly toward the right sacroiliac synchondrosis, with the brow anterior toward the left acetabulum and the frontal suture corresponding to the right oblique pelvic diameter. *Abdominal palpation* reveals the fetal back directed anteriorly to the left side, with the groove

between the occiput and fetal dorsum below, just above the pelvic brim; the breech is above and to the left side, with the extremities directed toward the maternal right side. The shoulders lie in the left oblique diameter, the right anterior and directed toward the right acetabulum, while the left shoulder lies toward the left sacroiliac synchondrosis. The fetal heart-sounds may be heard best below the umbilicus upon the right side of the abdomen.

(4) The chin posterior and to the left, *left mentoposterior;* symbol, L. M. P. (Fig. 118). *Vaginal examination* reveals the chin directed posteriorly toward the left sacroiliac synchondrosis, with the brow anterior toward the right acetabulum and the frontal suture corresponding to the left oblique pelvic diameter. *Abdominal palpation* reveals the fetal back directed anteriorly to the right side, with the groove between the occiput and fetal dorsum below and just above the pelvic brim. The breech is above to the right side, with the extremities directed toward the maternal left side; the shoulders lie in the right oblique diameter, the left anterior and directed toward the left acetabulum, while the right shoulder lies toward the right sacroiliac synchondrosis. The fetal heart-sounds may be heard best below the umbilicus upon the left side of the abdomen.

Differential Diagnosis of Face Presentations.—Not infrequently, in protracted labors with the face presenting, the great edema of the presenting part may, with inexperienced observers, lead to an error in diagnosis, and the condition be mistaken for a presentation of the breech. By a careful digital and abdominal exploration, with special reference to the points noted under the diagnosis of presentations of the pelvic extremity of the fetus (see page 149), the accoucheur may avoid such an error. *Fetal Diameters Involved.*—In face presentations the frontomental (8 cm., or 3.1496 in.) and the bimastoid (7⅝ cm., or 3.0018 in.) diameters offer at the superior strait. While the frontomental diameter may correspond to one or the other oblique pelvic diameter, it is

not uncommon for the face to present transversely in the superior strait; during the progress of labor this becomes altered, so that the head descends obliquely.

The Mechanism.—Only when there occurs an anterior rotation of the chin does labor become possible, and not infrequently, even under this most favorable circumstance, a considerable degree of dystocia may be experienced. A persistent mentoposterior position is an absolutely impossible labor. A face presentation should, therefore, always be regarded as a dangerous complication of parturition, and its progress must be closely watched if it be found impracticable to convert the presentation into one more favorable to both mother and child. The gravity of the presentation lies not in the impossibility of delivery—for in mentoanterior positions spontaneous delivery is by no means uncommon, and the labor may even be one of remarkable ease—but in the vastly increased fetal and maternal risks. *Steps of the Mechanism.*—In a normal delivery of a face presentation the following steps in the mechanism may be noted: 1. *Complete extension of the head upon the shoulders.* It must be remembered that in the process of development all cases of face presentation pass through the various stages of extension from presentation of the bregma through that of the brow, until the extension becomes absolute, with the occiput in close apposition with the dorsum of the fetus. The greater portion of the face then lies posteriorly to the axis of the vertebral column, and, as the fetal body is impelled forward by the uterine contractions, the brow encounters the main portion of the resistance to labor, and extension of the head is completed with the chin occupying the most dependent position. 2. *Moulding of the face.* A certain amount of moulding occurs during the process of extension. Owing to the firm ossification of the facial bones and sutures the moulding is accomplished with difficulty, and the characteristically long delay in the engagement of the face may be thus explained. 3. *Lateral*

inclination of the head, with the anterior cheek farther down the pelvic canal than the posterior; there is a backward inclination of the chin in order that the presentation may accommodate itself to the pelvic cavity. 4. *Dilatation of the soft parts.* 5. *Descent of the face to the pelvic floor*, accomplished by the uterine contractions, together with a stretching of the fetal neck. Normally, the fetal neck from the chin to the sternum measures 4 cm. (1.5748 in.); under the stimulus of the maternal expulsive efforts this may possibly be stretched from 7½ to 9 cm. (2.95275 to 3.5433 in.), and the chin thus be brought into contact with the pelvic floor. 6. *Anterior rotation of the chin* under the symphysis pubis in accordance with the cardinal rule of internal rotation, the occiput sinking into the hollow of the sacrum. In L. M. A. presentations the chin rotates from left to right anteriorly, and the brow and occiput from right to left posteriorly; in R. M. A. presentations the chin moves from right to left anteriorly, and the brow and occiput from left to right posteriorly. It is upon the complete and successful performance of this step of the mechanism that the possibility of labor hinges. The impossibility of spontaneous delivery in the majority of persistent mentoposterior positions lies in the inability of the chin to strike the pelvic floor. If, from under-size of the fetal head or excessive roominess of the pelvic canal, anterior rotation be accomplished in these cases, the chin after a considerable delay rotates slowly from right to left anteriorly in R. M. P. presentations, while the brow and occiput rotate from left to right posteriorly; in L. M. P. presentations the chin moves from left to right anteriorly, and the brow and occiput from right to left posteriorly. 7. *Delivery of the head by a process of flexion.* The chin engages under the symphysis pubis, and the face begins to appear at the vulvar cleft, the malar bones occupying the position between the pubic rami, and the upper portion of the head resting upon the perineum. As the latter retracts the chin emerges from under

Order of Delivery of the Parts of the Face and Head in the Various Presentations.

Presentation.	VERTEX.		FACE.	BROW.	BREECH.		
	With the occiput *anterior.*	With the occiput *posterior.*	With the chin *anterior.*	With the chin *anterior.*	With the occiput *anterior.*	With the occiput *posterior.* Head *flexed.*	With the occiput *posterior.* Head *extended.*
Method.	By a process of *extension.*	By *extreme flexion*, followed by *partial extension.*	By a process of *flexion.*	By *partial flexion* followed by *extension.*	By a process of *flexion.*	The head remains *flexed.*	By *exaggerated extension.*
Order of appearance.	1. The supraorbital ridges.	1. The occiput (*from under the perineum*).	1. The chin.	1. The occiput.	1. The chin.	1. The chin.	1. The external occipital protuberance.
	2. The nose.	2. The supraorbital ridges.	2. The mouth.	2. The brow.	2. The face.	2. The face.	2. The small fontanel.
	3. The upper maxilla.	3. The nose.	3. The brow.	3. The upper maxilla.	3. The brow.	3. The brow.	3. The cranial vault.
	4. The mouth.	4. The upper maxilla.	4. The vertex.	4. The mouth.	4. The anterior fontanel.	4. The anterior fontanel.	4. The face.
	5. The chin.	5. The mouth.	5. The occiput.	5. The chin.	5. The vertex.	5. The vertex	
		6. The chin.					
Where appearing.	From under the retracting perineum.	From under the symphysis pubis.	From under the retracting perineum.	From under the symphysis pubis.	From under the retracting perineum.	From under the symphysis pubis.	From under the retracting perineum.

the symphysis pubis, and the remaining portions of the head rapidly appear from under the perineum in the following order: mouth, nose, brow, vertex, and occiput, the head then occupying a position of flexion. It is interesting to note the order of appearance of the various features of the face and head in the different fetal presentations. In the appended table may be found the order of delivery in the presentations thus far considered: 8. *Restitution* now occurs as in vertex presentations, the chin turning toward the left maternal thigh in the L. M. A. and L. M. P., and toward the right thigh in R. M. A. and R. M. P. presentations. 9. *External rotation*, the face continuing its movement to that maternal side toward which the chin was previously directed. This is accompanied by an internal rotation of the shoulders into the conjugate diameter of the pelvis, the anterior shoulder rotating in the first and third positions (L. M. A. and R. M. P.) from right to left anteriorly, and in the second and fourth positions (R. M. A. and L. M. P.) from left to right anteriorly. 10. Delivery of the body as in ordinary vertex presentations.

Persistent Mentoposterior Positions.—When the chin presents to either side in the transverse diameter, or if it be directed posteriorly and anterior rotation fail to occur, the labor is an impossible one; especially is this true when the chin is situated much behind the transverse pelvic diameter (Fig. 119). The chin may occupy such a position primarily, or it may rotate into the hollow of the sacrum during the progress of labor either from failure to strike the pelvic floor or from some insuperable obstruction preventing its anterior rota-

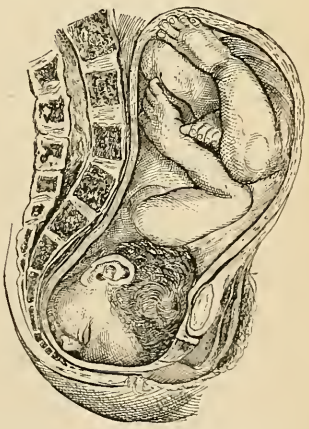

FIG. 119.—Back presentation of the chin.

tion. Under these circumstances it generally becomes absolutely impossible for the maternal forces to accomplish delivery. It is true that in the transverse position of the face it is possible for the excessive moulding and stretching of the fetal parts to cause the chin to descend the 9 cm. (3.5433 in.) of vertical depth of the lateral pelvic wall, thereby reaching the pelvic floor, when anterior rotation slowly takes place. That this favorable termination cannot occur when the expulsive forces of labor are deficient or when the chin holds a position in the hollow of the sacrum, is quite evident. To reach the perineum in the latter case a descent of 12¾ cm. (5.0196 in.) is required in order that the resistant forces may be met. This could only be accomplished by a simultaneous entrance of the thorax and occiput, 18½ cm. or 7.2834 in.—the trachelobregmatic diameter, 9½ cm. or 3.7401 in. plus the anteroposterior diameter of the thorax, 9 cm. or 3,5433 in.—into the superior strait, no diameter of which could accommodate such a bulk. As a result of the tetanic uterine contractions the head and shoulders become impacted, the child perishes, and the mother is exposed to the danger of uterine rupture.

Prognosis of Face Presentations.—Owing to the small fetal diameters concerned, this presentation, when the chin is anterior, is not attended with as high a mortality for either mother or fetus as is that of the brow. From 13 to 15 per cent. of the children perish under the most favorable circumstances, while a little over 6 per cent. of the mothers lose their lives. In persistent mentoposterior positions the fetal mortality becomes almost absolute. The *causes of fetal death* are asphyxiation and cerebral congestion from extreme pressure upon the jugular veins or from difficult operative procedures. The *causes of maternal death* are the same as in other malpresentations. The configuration of the fetal head after a face presentation is quite typical. The caput succedaneum involves mainly the cheeks in mentoanterior positions and the region around the eyes in the mentopos-

terior positions; in protracted cases the disfiguration is extreme. The head is elongated in its anteroposterior diameter and flattened from above downward; there is also an increase in the width of the skull.

Treatment of Face Presentations.—The management of a face presentation depends entirely upon the period at which it is recognized. Even under the most favorable circumstances, as when the chin is anterior from the beginning, the dangers attendant upon the presentation are of such gravity that an effort should be made to convert it into one more favorable to both mother and child, as of the vertex. If, however, the face should have engaged and the chin be well forward, nothing need be done, as spontaneous delivery will probaby follow after a labor of, it may be, but slight severity. It is not at all infrequent, nevertheless, for even these cases to require some manipulative procedure before accouchement be completed. The persistent mentoposterior cases always demand prompt and radical interference on the part of the accoucheur. In brief, the management of face presentations, from the simplest to the most complex conditions, may be stated to consist of the following procedures, in about the order in which they should be adopted: (1) If engagement have occurred and the chin be well forward, the case may be left to the forces of nature, with the expectation of a spontaneous termination, since, according to Zweifel, in the majority of face presentations the children are small, or, if of normal size, the pelves are large; a close watch, however, must be kept to prevent backward rotation of the chin. (2) *Postural Treatment.*—It should always be remembered that in a large proportion of face presentations before engagement has taken place, spontaneous version occurs with conversion of the presentation into one of the vertex. This, according to Reynolds,[1] may be due to contraction of the flexor muscles of the fetal neck; to changes in the woman's posture and corresponding alterations in the fetal

[1] *Trans. of the Am. Gyn. Soc.*, 1894, vol. xix. p. 64.

axis; or to changes of pressure due to irregular contraction of the lower uterine segment. This spontaneous correction of the presentation may be favored by placing the patient upon the side to which the fetal abdomen is directed; the forward displacement of the breech that will then occur will so alter the relationship existing between the long axis of the body and that of the head that flexion will occur from increased pressure by the resistant forces upon the anterior portion of the head. The maternal thighs should be flexed, so that the long axes of the uterus and the body will almost correspond. This failing, prolonged reclining in the knee-chest posture may result in flexion from displacement of the presenting part and contraction of the fetal muscles. If the head be partially fixed in the pelvic cavity, *Walcher's position* (Fig. 120) (the patient upon the

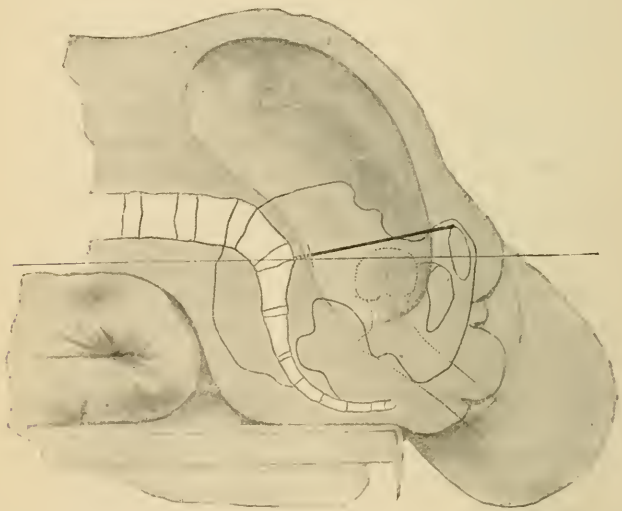

FIG. 120.—Walcher posture; the conjugate of the brim is indicated by a black line; the amount of space gained, by a dotted continuation of this line (Dickinson).

back, with the hips in extreme elevation at the edge of the bed or table and the thighs hanging in extreme extension)

may be tried, in the hope that displacement of the head may occur and correction of the presentation be effected. When the patient occupies this position, the conjugate diameter, according to Jewett,[1] is increased by from 5 to 13 mm., and labor will be facilitated by the addition of so much more room. (3) Postural treatment failing and engagement not yet having taken place, no matter what be the position of the chin, whether posterior or, as is most common, transverse, *cephalic version* is indicated. If labor have not yet begun, *Schatz's method of cephalic version* (Fig. 121),

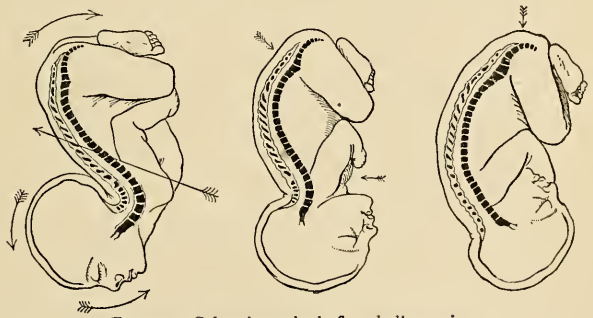

FIG. 121.—Schatz's method of cephalic version.

performed by external manipulations alone, should first be attempted. With one hand firm pressure is exerted against the anterior portion of the fetal neck, while counter-pressure is made with the opposite hand upon the occiput; at the same time an assistant pushes the breech in the direction in which the face is looking; the head is thus flexed upon the body and the vertex caused to present. If labor have already begun and the membranes remain as yet unruptured, *Baudelocque's method of cephalic version* should be attempted, the patient being anesthetized and care being taken to preserve the integrity of the membranes and thereby the hydraulic action of the liquor amnii. A dry labor in face presentation is especially disastrous to both mother and child. This

[1] *Trans. of the Am. Gyn. Soc.*, 1894, vol. xix. p. 81.

method may be performed in various ways: thus, as long as the membranes are intact one hand may be passed into the vagina and made to exert pressure against the shoulder and anterior thoracic surface of the fetus through the membranes or uterus, while the other hand, placed upon the abdominal surface, throws the breech in the opposite direction. If rupture of the membranes have occurred, one hand may be passed into the uterus and caused to grasp the occiput, which it pulls downward, while the external hand throws the chest upward and backward, the breech being carried by an assistant in the direction in which the face is looking; or, the "ratchet-movement," as described under the management of brow presentation (see page 430), may be performed. 4. Cephalic version having failed and the part not yet being engaged, *podalic version* is indicated. (5) Should engagement have occurred and the chin maintain a transverse or posterior position, anterior rotation must be effected, if this be possible. This may in some cases be accomplished by supplying the deficient resistant force by the hand (*Penrose's method*), the vectis, or one blade of the Simpson forceps. If the chin be directed to the right and posteriorly, the left hand should be introduced and pressure exerted upon the chin and posterior cheek, while if it be directed to the left, the right hand must be employed in a similar manner. If rotation cannot be secured by this maneuver, both blades of the forceps should be applied and an effort made to rotate the chin anteriorly, without, however, any attempt at traction unless the effort succeed and the chin advance under the symphysis. Under no circumstances should the forceps be employed as a tractor while the chin maintains a transverse or posterior position; all such efforts would be misdirected and only result in maternal injury or death. (6) All the foregoing methods having proved ineffectual and the head being well engaged, if the child still be viable *symphysiotomy* may be attempted, as suggested (at the Nineteenth Annual Meeting of the American Gyne-

cological Society, held in Washington in May, 1894) by Davis, Noble, and Lusk. In such cases Volland[1] suggests attempting the following manipulation before resorting to any more radical measures: He has found that in most cases the frontomental diameter does not lie exactly in the median line, but that a point on the brow, above either the right or the left eye, catches upon the symphysis, while the chin is directed toward the corresponding side of the mother; that is, if the right side of the brow be involved, the chin will be directed toward the right side of the mother posteriorly. The hand corresponding to that side of the mother from which the chin is turned is introduced into the vagina, and the index finger hooked under the chin, and this forcibly rotated forward during the intervals between the pains; at the same time an effort is made to draw the chin down. After several such efforts the face may gradually be brought into the transverse pelvic diameter, and then with the index finger alone it is pressed forward and pulled downward until it emerge under the pubic arch. Such a procedure, if successful, may prevent maternal or fetal mutilation. If, however, fetal death be assured, *craniotomy* with perforation of the skull through an orbit is the only justifiable procedure. In neglected mentoposterior cases the child is usually defunct, and mutilation of the mother is unwarrantable.

(*k*) *Transverse or Preternatural Presentation; Presentation of the Trunk, or Cross-birth.*—By a *transverse* presentation is meant one in which the long axis of the fetus lies at a right angle to the long axis of the uterus, or, more frequently, bisects that axis obliquely. This is by no means an infrequent complication of labor, occurring once in about 250 cases, or, more accurately, in about one-half of 1 per cent. of all cases of labor. It is much more common in multiparæ than in primiparæ, because of the lax condition of the abdominal and uterine tissues in the former. *Varieties.*—Under this heading are included all the possible trunk pres-

[1] *Therap. Monatshefte*, 1894, No. 8, p. 391.

entations—namely, of the hand, arm, elbow, shoulder, abdomen, breast or thorax, back, side, and neck. While it is true that any of these presentations may, and under certain circumstances do, persist throughout labor, the shoulder being the most prominent and most resistant portion of the trunk, under the influence of the uterine pains, if spontaneous version do not occur, it becomes in the vast majority of instances the most dependent portion of the fetus; the trunk presentation is thus generally resolved into one of the upper extremity (shoulder presentation).

Shoulder Presentation.—Etiology.—There may be certain fetal conditions that will cause a transverse position of the child in the uterine cavity, or the abnormal presentation may be the result of certain alterations in the size and shape of the maternal genitalia or of the parturient canal. Among the *fetal causes* may be mentioned oversize of the fetal head, preventing its engagement in the superior strait, as in hydrocephalus or in excessive development of the head; overgrowth of the entire fetus; fetal monstrosities; mobility of the fetus, as in hydramnios, in under-sized or immature fetuses, or after fetal death has occurred; and multiple pregnancy, resulting in distortion of the uterine cavity. The *maternal causes* embrace multiparity (from the lax condition of the uterine and abdominal walls); deformities of the uterus (uteri incudiformis and bicornis); undue obliquity of the uterus, as when the abdomen is pendulous, the fetal ellipse descending obliquely in the parturient canal; uterine and pelvic tumors, as fibromata or myomata of the lower uterine segment; exostoses of the pelvic bones or the lordosis of a kyphotic spine; pelvic deformities preventing engagement of either extremity of the fetal ellipse; placenta prævia, causing lateral displacement of the fetal presentation; tight-lacing during pregnancy, resulting in a decrease in the vertical depth of the uterus, with a corresponding increase in its lateral capacity; and traumatism, as falls or jars. *Varieties.*—As in

other presentations, there are four possible positions for the shoulder to occupy—namely, with the back directed anteriorly or posteriorly, and with the head to the left or to the right side of the pelvis. These positions are named respectively left or right dorsoanterior and left or right dorsoposterior. The dorsoanterior positions are twice as common as the dorsoposterior, and the head is usually directed toward the left.

Diagnosis.—1. The back anterior with the head to the left, *left dorsoanterior;* symbol, L. D. A. (Fig. 122).—This is the most common position of the shoulder. *Vaginal examination* before labor begins reveals a high position in all the transverse presentations with a flattening of the vaginal vault and a peculiar pouch-like projection of the bag of waters, somewhat resembling the finger of a glove. In advanced cases, after rupture of the membranes, it is not at all uncommon to find a prolapse of the arm with the hand protruding from the vulvar orifice. An easy rule for ascertaining which arm it is that is protruding is the following (Lusk): Let the hand be so turned that the palm is directed upward; then if the thumb extend toward the right maternal side, it is the right hand, and *vice versâ.* In this first position the right arm would present. Again, if on shaking hands with the fetus the two thumbs correspond, the right hand of the accoucheur being used, it is the right fetal hand, and *vice versâ.* Introducing the fingers through the cervical canal, the characteristic features of the shoulder may be recognized—namely, the acromion process; the head of the humerus; the spine of the scapula; the axillary space, which always points toward the feet, and therefore serves as a means of diagnosis for the position of the head; the ribs; and, posteriorly and to the left, the clavicle. *Abdominal palpation* reveals the hard rounded head resting in the left iliac fossa, with the breech in the right iliac fossa and the fetal extremities in the upper portion of the abdomen on the right side. The fetal heart-

sounds may be heard below the umbilicus and on the left side of the abdomen, but considerably higher than in vertex presentations.

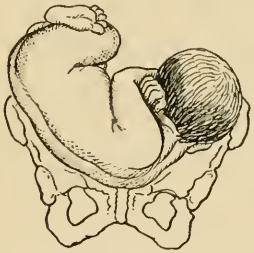

FIG. 122.—Shoulder presentation, L. D. A.

FIG. 123.—Shoulder presentation, R. D. A.

2. The back anterior with the head to the right, *right dorsoanterior;* symbol, R. D. A. (Fig. 123).—*Vaginal examination* reveals the same general features as in the foregoing position, except that in case of prolapse of the arm it would be the left that presented, while the clavicle would lie posteriorly and to the right. *Abdominal palpation* reveals the head in the right with the breech in the left iliac fossa, and the extremities in the upper portion of the abdomen and to the left side. The fetal heart-sounds may be heard below the umbilicus and on the right side of the abdomen.

3. The back posterior with the head to the right, *right dorsoposterior;* symbol, R. D. P. (Fig. 124).—*Vaginal examination* reveals the same features as before, with the clavicle, however, situated anteriorly and to the right side; the right arm would present in case of prolapse. *Abdominal palpation* reveals the head in the right with the breech in the left iliac fossa, and the extremities in the upper portion of the abdomen and to the left side. The fetal heart-sounds may be heard below the umbilicus and to the right side of the abdomen.

4. The back posterior with the head to the left, *left dor-*

soposterior; symbol L. D. P. (Fig. 125).—*Vaginal examination* reveals the same general features as before, with the clavicle, however, directed anteriorly and to the left side; the left arm would present in case of prolapse. *Abdominal*

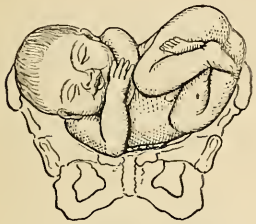

FIG. 124.—Shoulder presentation, R. D. P.

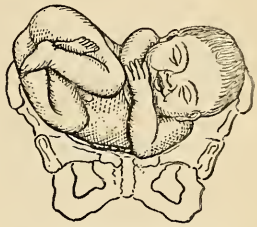

FIG. 125.—Shoulder presentation, L. D. P.

palpation reveals the head in the left with the breech in the right iliac fossa, and the extremities in the upper portion of the abdomen and to the right side. The fetal heart-sounds very often cannot be heard in this position, or but indistinctly.

The Mechanism.—It may be stated that practically there exists no mechanism for a transverse presentation. There are, however, several possibilities that must be taken into consideration: 1. It is not an unusual occurrence for a transverse position that has persisted for some time during pregnancy to be converted into a longitudinal position by the first few pains of labor. Upon practising abdominal palpation after labor has been in progress a short time the accoucheur may be astonished to find that he has to treat either a cephalic or a pelvic, instead of, as at first, a transverse presentation. This occurs as a result of the so-called *spontaneous version* produced by the uterine contractions themselves, and is most commonly observed in multiparæ, in whom there is a great laxity of the tissues and consequently more room for the change to be accomplished. According to Lusk, there are four conditions that are essential for the occurrence of this phenomenon—namely,

an undilated cervix, strong uterine contractions, a well-developed and living fetus, and nonengagement of the presenting shoulder. It may occur either before or after rupture of the membranes—though more commonly before—and is partial or complete according as to whether the primary presenting part rotate through an arc of a circle represented by 90° or 180°. *Complete version* is very rare, and consists in the transformation of a cephalic into a pelvic presentation, or the converse. Spontaneous version is accomplished with much more ease and with more safety to both fetus and mother when the membranes remain intact and the liquor amnii is present. The mechanism after version has occurred is that of the vertex or breech, according as to which part is made to present at the superior strait.

2. In the vast majority of cases of persistent transverse presentation the woman is incapable of delivering herself. Should such a case be permitted to continue without correction, the course is generally as follows: (1) Steadily increasing uterine contractions, ultimately becoming tetanic; (2) forcible descent of the shoulder, which finally becomes impacted in the parturient canal, it may be just within the vulvar orifice, with or without prolapse of the arm, and with extreme lateral displacement of the head upon the opposite shoulder, upon the thorax, or even upon the breech. This very promptly results in fetal death from compression of the cervical vessels, with consequent asphyxiation; (3) progressive dilatation and thinning of the lower uterine segment, with a corresponding rise of Bandl's ring, which may assume a position from 5 to 8 cm. (1.9685 to 3.1496 in.) above the pelvic brim, threatening rupture of the uterine wall; such a state of affairs contraindicates the performance of version; (4) maternal death from exhaustion or uterine rupture.

3. Under certain circumstances, as in premature labors with under-size of the fetus, or when fetal death with

subsequent maceration has occurred, and the capacity of the maternal pelvis is large and the expulsive forces are powerful, nature will dispose of even these impacted shoulder presentations by a process known as *spontaneous evolution* (Figs. 126–129). By this term is meant the unaided occurrence in childbirth of a series of changes whereby a shoulder is transformed within the pelvis into a complex presentation—either of the breech and the shoulder or of the head and the thorax—and delivery finally effected. This, of necessity, is of rare occurrence, and is possible only under the complexus of circumstances just enumerated. There are two varieties of spontaneous evolution described—namely, that in which the breech is delivered first, which is most frequent, and that in which the shoulder first emerges, followed by the head and thorax, the child being doubled up upon itself (*corpore conduplicato vel reduplicato*); the latter is of extremely rare occurrence. The mechanisms of these two phenomena are as follows: (1) *Of spon-*

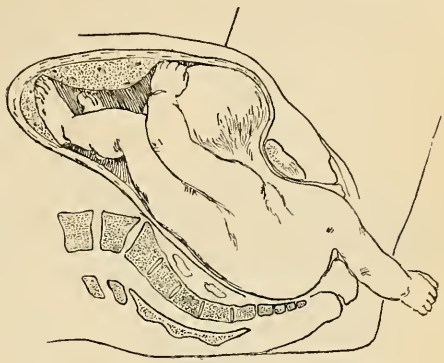

FIG. 126.—Spontaneous evolution, first stage.

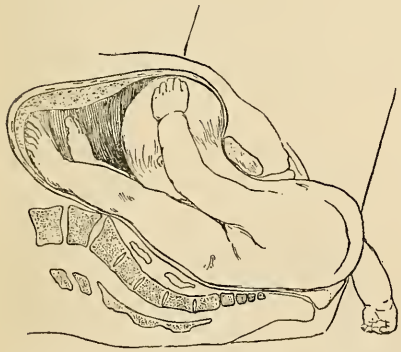

FIG. 127.—Spontaneous evolution, second stage.

taneous evolution by the breech (*Douglas's method*): (*a*) Slow descent of the prolapsed arm and impacted shoulder under the impulse of powerful uterine contractions; (*b*) internal rotation of the thorax into the conjugate diameter of the pelvis: the head now rests above, while the prolapsed shoulder becomes engaged under the symphysis pubis, and the breech approaches the head; (*c*) descent of the breech past the fetal neck and shoulder; (*d*) delivery of the side of the thorax and breech, and, finally, of the lower extremities; (*e*) birth of the remaining shoulder and then of the head. (2) *Of spontaneous evolution by the head* (*corpore conduplicato vel reduplicato—Roederer's method*): (*a*) The first step is precisely the same as in the preceding mechanism; (*b*) simultaneous descent of the head and thorax into the pelvic cavity, the upper arm extending along the thighs; (*c*) birth of the prolapsed shoulder, then of the head and shoulder, and finally of the breech and legs.

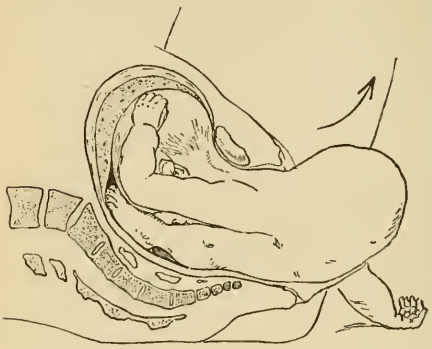

FIG. 128.—Spontaneous evolution, third stage.

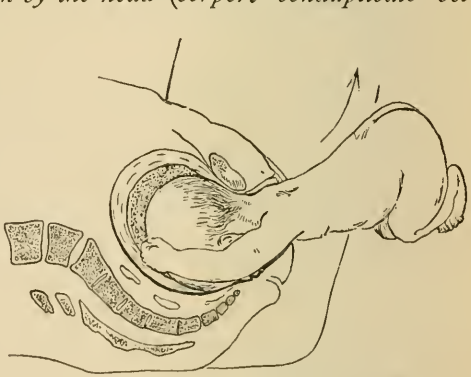

FIG. 129.—Spontaneous evolution, fourth stage.

Prognosis of Transverse Presentations.—At the best, a trunk

presentation is a serious matter for both mother and child, and especially for the latter; fully 50 per cent. of the children will perish, while about 11 per cent. of the mothers lose their lives in neglected cases. The *causes of fetal death* are asphyxiation from compression of the cervical vessels, brain-centers, or funis; prolapse of the cord; and injury during obstetric manipulations. *Maternal death* results from exhaustion, rupture of the uterus, hemorrhage, or sepsis. If the transverse presentation be corrected prior to the onset of labor or before engagement of the presenting part have occurred, the risks to the mother are but slight, provided no serious conditions, as a grave pelvic deformity or abnormal growths, be present.

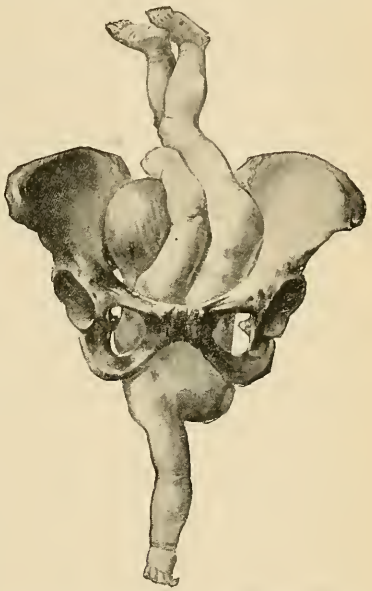

FIG. 130.—Spontaneous evolution, second and rare form of mechanism, known as birth with double body (one-sixth natural size, redrawn from Küstner).

Treatment of Trunk Presentations.—The treatment will vary according to the stage of the labor. 1. If the woman be seen before labor, immediate external cephalic version is indicated: the corrected longitudinal position of the fetus must then be preserved by the application of pads in front of and behind the fetal head; these pads must be held in place by an abdominal binder. 2. If labor have begun and the membranes be still intact, cephalic version may be tried by the external or by Baudelocque's method. 3. If the membranes have ruptured, cephalic version by the combined

method may be attempted, or, this failing, podalic version is to be resorted to. 4. In case of impaction of the shoulder the fetus must be decapitated, or removed by some other form of embryotomy.

VERSION, OR TURNING.—By this term is meant an obstetric operation whereby, chiefly by manual efforts on the part of the accoucheur, the position of the fetus *in utero* is altered so that one extremity of the fetal ellipse is made to take the place occupied by the other extremity or by some portion of the trunk. *Varieties.*—There are described three main varieties of version: (1) *Cephalic*, that in which the fetus is so turned as to cause a presentation of the head; (2) *pelvic*, that in which the breech is caused to present at the superior strait; (3) *podalic*, that in which one or both feet are grasped and dragged down into the parturient canal.

(1) *Cephalic version, or version by the head* is a turning of the fetus so as to cause a presentation of the head. *Indications.*—This variety of version is indicated when the following conditions exist: (*a*) Certain malpositions of the head, as a presentation of the face, the brow, the ear, or the parietal bone; (*b*) presentation of the breech, if a diagnosis be made before the onset of labor; it is then done to ensure greater safety to the fetus; (*c*) presentation of the trunk if the cephalic extremity of the fetal ellipse can be more readily caused to present, as is generally the case. *Contraindications.*—The contraindications to the performance of cephalic version are: (*a*) Any degree of pelvic contraction; (*b*) rigidity of the uterus; (*c*) any condition indicating rapid delivery of the child, as threatened fetal or maternal death; (*d*) immobility of the fetus; (*e*) an irreplaceable prolapsed arm. *Conditions Favoring the Operation.*—The most favorable circumstances for the performance of cephalic version include: (*a*) The time—either before or during the first few pains of labor; (*b*) the presence of the liquor amnii; (*c*) multiparity—the uterine capacity in general is greater in multiparæ than in primiparæ; (*d*) fetal mobility. *Advantages.*—The

reasons why cephalic version is preferable are: (*a*) The most favorable fetal presentation—that of the vertex—is secured; (*b*) the head is generally closest to the plane of the superior strait, and is therefore more readily caused to present; (*c*) the head can be acted upon most readily by the external hand. *The Methods.*—Cephalic version may be performed in a variety of ways, as follows: (*a*) *Postural version*, or that alteration in the cephalic presentation produced by a change in the position assumed by the mother. Postural version is always employed for the purpose of bringing down the vertex; it is of service in face and brow presentations, and in lateral deviations of the head, as when the ear or parietal eminence presents. In the latter case the patient must be placed upon the opposite side to that occupied by the fetus; the breech is thus made to sink to the dependent side and the vertex is drawn back over the center of the plane of the superior strait. (*b*) *The External Methods, or Abdominal Version.*—These methods are difficult to perform, and are only serviceable in the hands of a skilled obstetrician when there is relaxation of the abdominal walls, and before the escape of the liquor amnii. They are used to correct face, brow, and transverse presentations when it is desirable that the membranes remain unruptured and rapid delivery is not indicated. *Schatz's* and *Baudelocque's methods* of external cephalic version have been described. *Wiegand's method* consists of the following steps: 1. *The Position.*—The woman is placed in the dorsal position with the knees and thighs flexed and the abdomen exposed; the accoucheur, standing by the right side of the patient, faces the head of the bed. 2. One palm is placed over the cephalic and the other over the pelvic extremity of the fetus. 3. By a succession of gentle impulses in the intervals between the pains the breech is moved upward toward the median line, while the head is directed downward toward the pelvic inlet; these efforts must cease during the presence of a pain. 4. *Fixation of the Head.*—If labor have not yet

begun, the corrected position must be maintained by two long rolls or pads placed one on either side of the fetal head and held in position by a firm abdominal binder. If, however, labor be in active progress, the vertex, as soon as it come into apposition with the superior strait, may be pressed as far downward into the brim as possible by a hand placed upon either side, and the membranes then ruptured, provided the os have dilated to at least three-fifths of its full dimensions. (*c*) *The Combined or Mixed Method.—Bimanual or bipolar version* is that variety of cephalic version in which the position of the fetus is altered by pressure exerted upon both poles of the fetal ellipse, one hand being placed upon the abdominal surface of the mother and the other introduced within the vagina. *Indications.*—This method of version is indicated in cases of transverse presentations. There are two methods of performing combined cephalic version—namely, Braxton Hicks' method and Hohl's method, the former being most frequently employed. *Braxton Hicks' Method of Cephalic Version.*—(1) *Preparatory Treatment.*—The patient must be anesthetized and placed in the lithotomy position; the bladder and rectum must be emptied; (2) thorough asepsis of the vagina and cervical canal is essential; (3) upon the abdominal surface is placed the hand that corresponds to the position of the head—*i. e.* if the head lie in the right iliac fossa, the left hand of the accoucheur is used externally, and *vice versâ;* the opposite hand is introduced into the vagina, while the index and middle fingers enter the cervical canal and rest upon the presenting shoulder; (4) the external hand presses the head downward and inward, while the fingers within the cervix press upward and outward; the head generally adjusts itself to the pelvic brim quickly and with an almost audible snap; (5) rupture of the membranes; (6) delivery by the forceps. *Hohl's method of cephalic version* is essentially the same as the preceding, with the exception that the internal hand is that corresponding to the

head, upon which the external hand makes pressure, an assistant at the same time pressing the breech in the direction primarily occupied by the head.

(2) *Pelvic version, or version by the breech*, is a turning of the fetus by which a presentation of the pelvic extremity of the fetal ellipse is induced. Complete podalic version has very largely supplanted this method. *Indications.*—Version by the breech may be indicated under certain circumstances, thus: (*a*) Minor degrees of pelvic contraction in which speedy delivery is not required; (*b*) presentations of the trunk in which the breech is nearest the plane of the superior strait, and therefore more readily caused to present; the membranes must be intact, the abdominal walls relaxed, and the child freely mobile. *Methods.*—Two methods of performing pelvic version are described: (*a*) *External manipulations, the steps of the method being* as follows: (1) The patient is placed in the dorsal decubitus with the limbs somewhat flexed; (2) the physician stands to the left side of his patient with his face directed to the head of the bed; (3) the breech is pressed downward and inward and the head upward and outward, all manipulations being made in the intervals between the pains. (*b*) The *combined method of Braxton Hicks*, as described under cephalic version, the breech, however, being brought down instead of the head.

(3) *Podalic version, or version by the feet*, is that variety in which the fetus is caused to rotate through a quarter or half of a circle, and one or both feet are brought down into the parturient canal. *Indications.*—This very commonly employed variety is indicated in a number of conditions, as follows: (*a*) Malpresentations of the head when attempts at cephalic version have failed; (*b*) transverse presentations of the fetus; (*c*) minor degrees of pelvic contraction, the conjugate diameter of the superior strait being reduced from 9½ to 8 cm. (3.7401 to 3.1496 in.); in these cases it must be remembered that symphysiotomy

may give better results; (*d*) placenta prævia; (*e*) anything indicating speedy delivery, as threatened maternal or fetal death from grave pathologic states (heart-failure, aneurysm, advanced tuberculosis, eclampsia) or from the accidents of labor (uterine rupture, accidental hemorrhage, funic prolapse); (*f*) sudden death of the mother. *Contraindications.*—The contraindications to the operation are three in number: (*a*) Engagement or impaction of the presenting part; (*b*) tetanic contraction of the uterus with ascent of Bandl's ring; (*c*) extreme contraction of the pelvis. *Conditions Favoring the Operation.*—The conditions making the performance of podalic version easy are—(*a*) Dilatability of the cervix; (*b*) tenuity of the abdominal walls; (*c*) the presence or the recent escape of the liquor amnii; (*d*) a large pelvic capacity. *Conditions Unfavorable to the Operation.*—Should any of the following conditions exist, the operation becomes one of extreme difficulty: (*a*) Rigidity of the cervix uteri; (*b*) congenital or acquired atresia of the cervix, vagina, or vulva; (*c*) tetanic contraction of the uterus, as after the administration of ergot or in neglected cases; (*d*) any increase in the bulk of the uterine contents, as in multiple pregnancy or when a fetal monstrosity presents; (*e*) fixation of the fetus in the uterine cavity, as after escape of the liquor amnii; (*f*) spasmodic contraction of the abdominal muscles from any cause (hysteria or eclampsia); (*g*) obesity of the patient. *Advantages.*—The reasons why podalic version is preferable in the properly selected cases are—(*a*) It permits of a rapid delivery; (*b*) it may be performed early in labor. *Dangers.*—There are, however, some dangers to both mother and child in its performance. These are—(1) *Maternal.*—(*a*) Sepsis may follow the introduction of the hand into the uterine cavity, especially if proper precautions be not observed; (*b*) rupture of the uterus may occur from injudicious haste in the operation; (*c*) laceration of the cervix is not uncommon, since the operation is frequently performed before complete dilatation has been ac-

complished; (*d*) subsequent metritis and endometritis have been noted from injuries received during the necessary manipulations. (2) *Fetal.*—Injury or death of the fetus may occur during the necessary traction. *Methods.*—Podalic version may be performed by the *combined* and the *internal* methods.

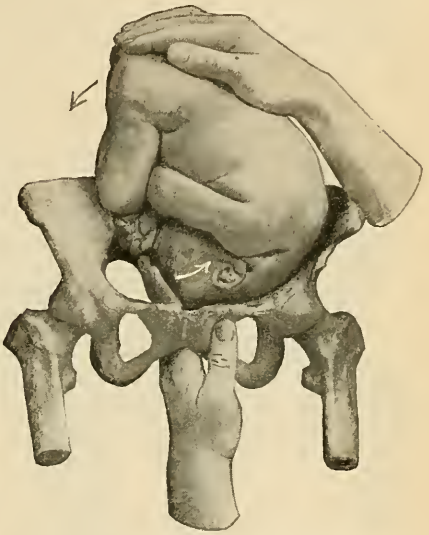

FIG. 131.—The first step of bipolar podalic version: two fingers within the cervix lift the head toward the iliac fossa, while the breech is crowded over toward the other ilium (Dickinson).

The combined, bipolar, or Braxton Hicks' method.—In this method not only are the fingers introduced into the uterine cavity, but the manipulations are assisted by pressure exerted upon the fetal ellipse through the abdominal walls. *Advantages.*—This method is to be recommended for the following reasons: (*a*) It may be performed early in labor; (*b*) there is a minimum of danger of sepsis; (*c*) the danger of uterine rupture is less than in internal version. *Steps.*—The operation includes—(1) Complete anesthetization (etherization) of the patient, with evacuation of the bladder and rectum. (2) Thorough asepsis of the vaginal and cervical canals. (3) *The Position.*—The patient should occupy the dorsal position at the side of the bed, while the operator sits facing her. (4) *The Internal Hand.*—The generally accepted rule is to introduce into the vagina and uterus "the hand that midway between pronation and supination will correspond to the fetal abdomen;" thus, if the latter be directed to the maternal left side, the right hand

should be employed internally, and conversely. (5) *The Introduction of the Hand.*—The internal hand and arm to the elbow, after thorough lubrication, should be slowly introduced into the vagina until two or three fingers enter the cervical canal (Fig. 131). The membranes, if intact, should not be ruptured. (5) *First Step of the Version.—Displacement of the Presentation.*—This varies with the position of the fetus. If the *head* present, it must be made to extend—that is, it must be pushed in the direction toward which the occiput is pointing; thus, in the L. O. A. and L. O. P. positions the head is pressed toward the left maternal side, while in the R. O. A. and R. O. P. positions it is displaced to the right. Simultaneously the external hand inclines the breech in the opposite direction. If a *transverse* position exist, the shoulder should be displaced in the direction of the head. (6) *Second Step of the Version.*—Displacement, as before, of the shoulder (in cephalic) and of the thorax and abdomen (in transverse presentations), together with further downward displacement of the breech. (7) *Third Step of the Version.*—Rupture of the membranes if these be still unruptured, and traction upon an extremity, the knee or foot (usually the former) being seized, the external hand now directing the head upward. (8) Version being completed, delivery of the fetus by traction upon the extremity, as in an impacted breech presentation.

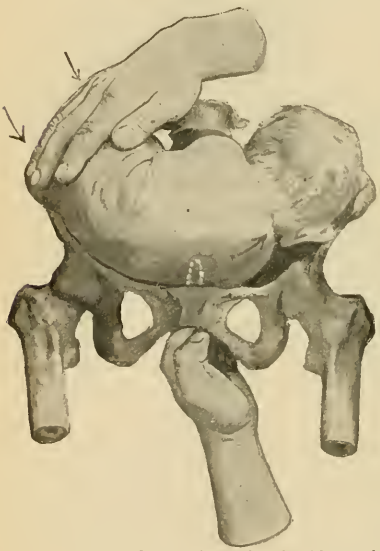

FIG. 132.—Bipolar version: the shoulder and arm are pushed along; the breech is pushed downward (Dickinson).

Internal podalic version is that form of podalic version in which the entire hand is introduced into the uterine cavity. *Indications.*—This operation becomes necessary when there has occurred an escape of the liquor amnii some time before

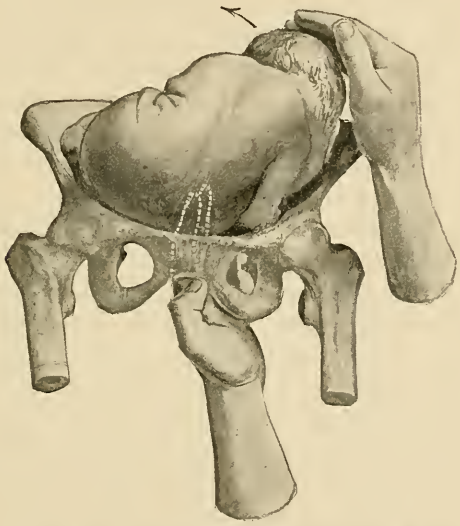

FIG. 133.—Bipolar version: the knee is almost within reach, the head is pressed upward (Dickinson).

version is attempted. *Dangers.*—The risks attendant upon its performance are—(*a*) Increased liability to sepsis, from introduction of the hand into the uterine cavity; (*b*) uterine rupture from such a considerable addition to the bulk of the uterine contents. *Steps.*—The steps of the operation include—(1) Complete anesthesia; the bladder and rectum must be emptied. (2) Thorough vaginal and cervical asepsis. (3) *The Position.*—The patient lies in the lateral position at the side of the bed: she is placed upon that side toward which the fetal feet are directed, thus favoring a low position of the latter, so that they become more accessible. (4) *The Internal Hand.*—The same rule is adopted

as in the preceding method. (5) *Introduction of the Hand.*—The hand and arm, well oiled, are introduced into the vagina and the fingers into the cervix, counterpressure being maintained by the external hand over the fundus uteri. Should a uterine contraction occur, manipulations must cease until it have passed, when the hand should be advanced over the fetal abdominal surface and the knee grasped and hooked down, so as to bring the foot into ready reach; in transverse presentations the latter is more accessible than in head presentations. (6) The foot is grasped in such a manner that the heel corresponds to the palm of the hand, and downward traction is made until the knee passes the vulvar orifice, the head at the same time being pressed upward by the external hand; the anterior foot is the one that is usually seized, for the simple reason that it is the most accessible. It will suffice, and in fact is preferable, to bring down one foot only; by so doing, with the foot grasped as described, an anterior position of the breech is secured, while the untouched limb, holding its position upon the fetal abdomen, tends to more thorough dilatation of the os. (7) The administration of the ether is stopped, the patient is placed in the recumbent posture, and the further progress of the case is left to the natural forces unless there exist some indications for speedy delivery. If it be desirable to terminate labor at once, both feet must be seized and the child extracted speedily. *Complications.*—There are certain conditions that may render the operation very difficult. These are—(1) *Cervical Rigidity.*—A rigid condition of the cervix may result from the employment of ergot during the early stages of labor; it may exist as an accompaniment of the prematurity of the labor; or it may be a natural condition, as in elderly primiparæ. Usually it will disappear under thorough anesthetization, with the gradual introduction of one or more fingers arranged in the shape of a cone; the smaller sizes of Hegar's dilators may be required to begin the dilatation. (2) *Acquired or Con-*

genital Atresia Vaginæ.—This frequently constitutes almost an insuperable obstacle to the introduction of the hand. If an entrance cannot be effected by gradual dilatation, numerous deep incisions in the vaginal wall will be necessary, and any hemorrhage that may result must be controlled by the usual methods. (3) *Prolapse of an Arm.*—Ordinarily, this cannot be regarded as a complication in the performance of the version; it does not prevent the introduction of the hand, and may even be of service in facilitating the operation. As the pelvic extremity is brought down, the arm rises with the thorax into the pelvic cavity: in order to favor this movement Galabin formerly suggested that the foot of the opposite side to that of the presenting arm should be seized; he claimed, though erroneously, that more room is thus afforded for the ascent of the arm; in point of fact, as is now generally admitted, the leg of the corresponding side is more easy of access, and version by this limb is more readily performed. To prevent extension of this extremity by the side of the head the following maneuver may be adopted: A piece of tape is secured around the fetal wrist and allowed to project from the vulva; during the delivery of the abdomen and thorax this tape should be held taut, so that the arm is carried in front of the face and descends with the shoulders. (4) *Difficulty of Rotation.*—In some cases in which there has occurred a complete escape of the liquor amnii, followed by more or less rigidity of the uterine and cervical tissues, the fetus will be firmly grasped by the uterine walls, and traction upon the foot does not accomplish a rotation of the child. As a rule, this difficulty may be overcome by slipping a loop of tape over the ankle; upon this traction may be exerted through the vulvar orifice, while the internal hand pushes the head and shoulders in the direction of the fundus.

EMBRYOTOMY.—Embryotomy is a term given to an obstetric operation employed for the purpose of reducing the size of the fetus in order to render possible its transmission

through the parturient canal. It embraces the operations of craniotomy (see page 438), evisceration, decapitation, and amputation of the extremities.

1. *Evisceration* (*Exenteration*).—This term indicates the opening of a body-cavity, thoracic or abdominal, and the removal of the contained viscera. *Indications.*—Such a mutilating operation is required—(*a*) when there occurs an impacted presentation of the abdomen; (*b*) in certain fetal monstrosities. *Instruments.*—The instruments required for its performance are a pair of strong, straight scissors about 8 inches in length and having the handle turned downward, and a blunt hook. *Steps of the Operation.*—The steps of the operation are—(1) Pressure by an assistant from above or traction upon a limb in order to secure as dependent a position of the presenting part as is possible: (2) Introduction of the index and middle fingers of the left hand as far as the cervical canal to serve as a guide; (3) Passage of the scissors along the palmar surface of these fingers and perforation of the abdominal or thoracic parietes; (4) Introduction of a finger or the blunt hook through the perforation and removal of the viscera by morcellement: the trunk-walls will then collapse; (5) Traction upon the pelvic extremity of the fetus in order to facilitate its delivery. If this cannot be accomplished, *spondylotomy* or *rachiotomy* (section of the spinal column) may be performed by means of the scissors, the fetus being delivered as in corpore reduplicatio.

2. *Decapitation* (*Decollation*).—Division of the fetal neck in labor when neither spontaneous delivery nor delivery by version is possible. *Indications.*—There are but three conditions in which decapitation may become necessary. These are—(1) Impaction of a shoulder presentation with high position of Bandl's ring; (2) a twin presentation with locking of the chins; (3) certain fetal monstrosities. *Instruments.*—A decollator is required—usually Ramsbotham's sharp hook or Braun's blunt-hook (Fig. 134); as substitutes

may be used a pair of scissors or a piece of twine or of flexible wire, which, being passed around the neck, may sever the latter by a sawing movement (*Pajot's method*); a Sims speculum is also necessary. *Steps of the Operation.*—The operation consists in—(1) Traction by an assistant upon the prolapsed arm or other protruding portion. (2) Insertion of the hook around the neck and severing of the latter by a combined sawing movement with downward traction: if scissors be employed, the index finger of the left hand must be passed around the neck and the latter snipped through from below upward. (3) Traction upon the prolapsed member, the trunk and extremities slipping out of the parturient canal. (4) *Delivery of the Head.*—This may be accomplished by hooking the index finger into the orifice at the base of the head and drawing it down to the orifice of the cervical canal, when pressure from above and traction on the head may cause its escape. This failing, the cephalotribe may be introduced and the head seized and extracted.

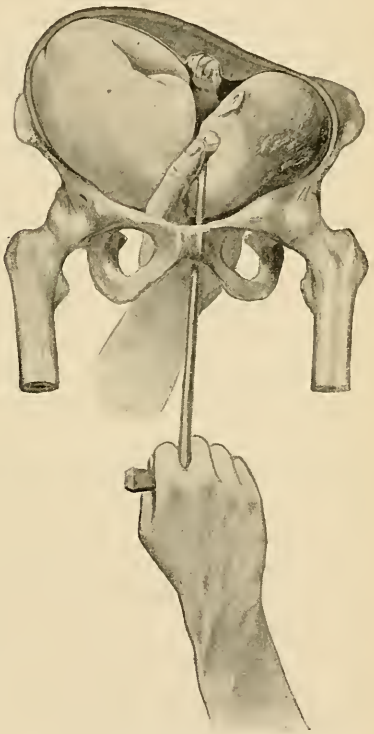

FIG. 134.—Decapitation with Braun's hook (Dickinson).

3. *Amputations of the Fetal Extremities.*—The removal of one or more limbs of the fetus in order to permit of its escape from the parturient canal. *Indication.*—This ope-

ration is indicated only in certain forms of fetal monstrosities. Fetal death or nonviability must be assured before the operation is performed. *Instruments.*—A strong pair of scissors is all that will be required. *Steps of the Operation.*—(1) The offending member must be dragged down so as to be rendered as accessible as possible; (2) by short snips the tissues must be divided and the part then extracted. *Mortality of Embryotomy.*—There is no reason why there should be any maternal mortality in this operation, provided it be performed at a proper time. There can be no doubt that the exhaustion consequent upon unsuccessful attempts at forceps-delivery, version, or traction before the mutilation of the fetus is responsible for most of the deaths. *After-treatment of Embryotomy.*—After the removal of the fetus thorough asepsis of the parturient canal must be observed, and the patient treated as after a normal labor.

(*l*) *Complex, Compound, or Complicated Presentations.*—These terms indicate a simultaneous presentation of two or more fetal parts; thus, there may occur a presentation of the head and a hand; the head and a foot; a foot and a hand; or, in transverse cases, the head and thorax. In multiple pregnancy a part of each fetus may present, giving a variety of compound presentation that will be treated of under the subject of plural births. The usual *treatment* of such a condition as this is the delivery of the main part first. Thus, if the head or hand present, the latter should, if possible, be pushed back, and the head delivered by means of the forceps. Should a foot and a hand present, podalic version is the proper course to pursue in order to avoid a prolapse of the arm with resulting shoulder presentation.

(*m*) *Superimpregnation; Multiple or Plural Pregnancy; Plural Births.*—That form of pregnancy in which the gravid uterus contains two or more fetuses. This subject includes the two analogous conditions that have been termed, respectively, superfetation and superfecundation. By *superfetation* is meant a supposed fertilization of an ovum when

there is another from a previous ovulation in uterogestation. There has been, and still is, considerable doubt as to the possibility of such an occurrence, and it may be stated that a second conception, if such a thing be possible, usually occurs within the first few days after the primary conception—that is, before the formation of the decidua: an explanation may thus be afforded for those cases occasionally encountered in which a woman gives birth to two children, one of which is white and the other black. Another theory in explanation of this phenomenon, and one that is probably more rational than the preceding, is that the semen has been deposited at two coitions occurring within a short period, but that the impregnation of the two ova has occurred at the same time; the well-recognized fact that spermatozoa retain their vitality in the female genitalia for a number of days after their deposition there renders such an occurrence not only possible, but very probable. The occurrence of superfetation at an advanced stage in the development of the primarily fertilized ovum seems, however, to have been proved by remarkable cases reported by Bonnar, Fordyce Barker, and Tyler Smith, and quoted by Playfair and Lusk. In these cases, within a few weeks or months after the birth of the first child, a second fully-developed fetus was discharged. The subject is an interesting one and worthy of further investigation.

By *superfecundation* is meant the fertilization of more than one ovum of the same ovulation resulting from one or separate acts of coitus. This develops into a variety of twin pregnancy. *A twin* or *gemellary pregnancy* is one in which two fetuses are developed simultaneously *in utero;* this occurs once in about 130 cases of gestation. When three fetuses are developed together they are termed *triplets*, and this occurs once in about 5688 pregnant women. Mirabeau[1] states that the more fertile a community—that is, the larger the number of multiparous women—the more com-

[1] *Ueber Drillingsgeburten*, München, 1894.

mon are triple births; thus, in Russia the ratio is 1 in 4054 pregnancies; in Sweden, 1 in 4400; in England, 1 in 4600; in Germany, 1 in 7129; and in France, 1 in 8256. Triple births are more common in multiparous women between thirty and thirty-four years of age, and the pregnancy is usually preceded by a long interval of sterility. Four children at a birth are termed *quadruplets*, and this will take place, according to Veit, only once in 371,126 pregnancies; a set of five children at a birth is termed *quintuplets;* and six offspring from a single gestation—one instance of which has been reported in Italy—are termed *sextuplets*.

Causes of Twin Pregnancies.—A predisposing cause of multiple (twin) pregnancy may, according to Duncan, be stated to be primiparity, the greatest number of reported cases having occurred in first pregnancies; in women who have once given birth to twins, however, there seems to be an increasing tendency to repeat the performance in subsequent gestations. Another predisposing cause is family heredity, remarkable instances of multiple pregnancy having occurred in successive generations of a given family. The *actual* cause of multiple pregnancy varies in different cases: thus, it may result when two Graafian follicles, situated in the same ovary or one in either ovary, arrive at full maturity and rupture simultaneously, and the ova thus discharged undergo fertilization at or about the same time. In other instances one Graafian follicle expels two mature ovules, both of which become impregnated simultaneously; or, finally, but one ovule may be discharged from a Graafian follicle, it having, however, two nuclei, both undergoing simultaneous impregnation; this is termed the *unioval origin* of twins. According to the origin of the ova will arise the peculiarities in the development of the membranes and fetal appendages. Thus, if two ova from separate Graafian follicles are fertilized, there will result an independent development of both; each will have its own placenta, cord, chorion, and amnion, and each will carry on a distinct

intrauterine existence. The placentæ, though they may be in close apposition, do not present vascular anastomoses. This condition has been termed *placenta obsoleta.* Should the two ovules have a common origin in a single Graafian follicle, the amniotic sacs will be distinct, but there will exist a chorion and a placenta in common, the two umbilical cords arising from the same placental structure. Finally, in those cases in which the twin pregnancy results from a single binucleated ovule, one placenta is formed with two cords, the fetuses being invested by a common chorion, but a distinct amnion. It occasionally happens that through abrasion by the fetal limbs or from some other cause the partition between the two amniotic cavities is ruptured: fetuses of this variety of twin gestation then erroneously appear to possess a common amniotic sac.

Triplets commonly arise from two ova, one of which was binucleated and hence gave origin to two fetuses instead of one; in this case there will be two placentæ and two sets of membranes, the one containing two embryos, each with a distinct amnion, but a common chorion, and the other containing one embryo with a normal arrangement of the membranes. It is possible, however, for each fetus to be provided with independent membranes.

The distribution of the *sexes* varies: in general, twins arising from a common ovum (unioval twins) are of the same sex, while those generated by distinct ova are of opposite sexes. Clinically, it has been found that, as a rule, the fetuses are of opposite sexes (about 38 per cent.); this failing, they are both likely to be males (34 per cent.), and, least frequently, both females (28 per cent.).

Diagnosis of Multiple Pregnancy.—The diagnosis of this interesting condition, if it be made at all, must be accomplished by digital exploration and by abdominal palpation and auscultation: in very many cases, however, the very first intimation of the unusual condition is the appearance of the second fetus during labor. The signs that may be

elicited by *external examination* are as follows: 1. By auscultation, *the presence of two fetal heart-sounds.* There may be heard at different points over the abdominal surface, it may be upon opposite sides, heart-sounds either of the same or different rates and intensities, and separated by an interval of space over which they cannot be heard at all, or only very indistinctly. This is a very valuable sign of multiple pregnancy, but by no means absolutely diagnostic. Thus, in the case of a large fetus, thin maternal abdominal walls, or a deficient quantity of liquor amnii, the heart-sounds may be heard with more or less distinctness over the entire surface of the abdomen. Again, there may be present *in utero* two fetuses, one of which may be dead or so situated that the heart-sounds of but one can be transmitted to the listener's ear. 2. Auscultation may also reveal *two distinct placental soufflés.* This is a sign of but little value. 3. Palpation reveals a number of signs of more or less value in formulating an idea of the existing condition. These signs are as follows: (*a*) *Excessive size of the abdomen*, with *increased tension* of the uterine walls and but *slight fetal mobility:* this is a suggestive sign; (*b*) *irregularity in the outline of the uterus*, with abnormal increase in its width; at times there may be detected a *sulcus*, longitudinal or transverse, indicating the space between the fetal bodies: this is not diagnostic; (*c*) *the presence of a number of fetal extremities or parts:* this is a sign of considerable value. If it be possible to palpate three or more fetal limbs, or the cephalic or pelvic extremities of two fetuses, as a head above and one below, or if a smooth, rounded dorsal curve may be detected in two distinct situations, very conclusive evidence is afforded that more than the usual number of fetuses are contained in the uterine cavity. Again, if a head can be clearly outlined near the pelvic brim, and the maximum point of intensity of the fetal heart-sounds be found at some point above the umbilicus, it is probable that the two belong to different fetuses; (*d*) inspection of the

abdomen may show the presence of a certain amount of edema of the region immediately above the pubis. This is dependent upon venous stasis, the result of the pressure exerted by the immensely distended gravid uterus upon the pelvic veins. It is not pathognomonic, however, as it is seen as well in extreme hydramnios. 4. The *vaginal signs* of multiple pregnancy. There are no characteristic changes in the vaginal symptoms in this condition. Occasionally, after cervical dilatation has well advanced there may occur a simultaneous presentation of two bags of water, which sign, of course, would be absolutely diagnostic.

Prognosis of Multiple Pregnancy.—This may be considered from a maternal and from a fetal standpoint. The *maternal prognosis* is somewhat graver than in uncomplicated gestation. The dangers are—(1) *Uterine inertia*, with prolongation of labor and subsequent tendency to postpartum hemorrhage; (2) *abnormal presentations*, as of the shoulder or trunk; (3) during pregnancy *serious pressure upon the ureters*, resulting in the retention of effete matters in the blood, with the production of the kidney of pregnancy or even of eclampsia. So frequently is albuminuria present in a twin gestation that by many it has been regarded as almost a diagnostic symptom of that condition; (4) *premature expulsion of the ovum.* It has been found that in about 25 per cent. of twin pregnancies labor occurred prematurely. The *fetal prognosis* is much more serious than is the maternal: the mortality rises to 8 or 10 per cent. or more, and this mortality is higher when the fetuses are of unioval origin. The *dangers* to the fetuses are as follows: (1) *Deficient development* from insufficient nutrition and lack of proper room. Owing to the crowded condition of the uterine cavity, proper play is not afforded the fetal limbs; the lack of intrauterine gymnastics results in poor muscular development of the limbs and of the entire body. The average weight of twin children has been found to be about five or six pounds. It is not unusual for one fetus to manifest a

greater degree of development than its fellow, and if this superiority of size occur at an early period in pregnancy, the impetus thus gained may attract to the larger and stronger fetus more than its share of nutrition; as a natural consequence, the smaller fetus is progressively crowded to one side of the uterine cavity, and finally perishes: the pressure increasing with the growth of the surviving fetus, the deceased twin mummifies, and finally becomes compressed between its fellow and the uterine wall, until at term it has a thickness little greater than that of stout parchment: hence its name—*fœtus papyraceus.* After the death of the fetus it may be discharged instead of undergoing the process of mummification, and its fellow continue to full term. Putrefaction of the deceased ovum has even been known to occur *in utero* without deleterious effects upon the surviving fetus. (2) *The formation of monstrosities.* Owing to the intimate relationship existing between the developing ova, especially in the case of the unioval variety, it is not uncommon to find one or both of the fetuses presenting some variety of malformation. This is generally brought about by a complex anastomosis between the vascular elements of the fetuses and of the placentæ. Thus, by a damming back of the circulation in the weaker fetus the entire direction of the blood-current may be reversed, an atrophy of the heart occur, and an acardiac monster result. Again, in the unioval variety of twins, should the division of the formative material be incomplete, there will be developed various forms of double monstrosities according to the degree of interference with the process. (3) *An increased tendency to diseases of the membranes.* Hydramnios is a not infrequent complication of multiple pregnancy resulting from some interference with the circulation of the parts. (4) *Malpositions and malpresentations.* Transverse presentation of the fetus is quite a common complication of twin gestations: it occurs once in about 22 cases; presentation of the breech is also frequent.

The Clinical Manifestations of Labor in Multiple Pregnancy.—The labor is precisely like that occurring when but one fetus is contained *in utero.* As a rule, it is easy, owing to the inefficient character of the pains—a direct consequence of the extreme distention of the uterine walls and the small size of the fetuses: the first stage of labor, however, is protracted. After the birth of the first child the cord should be ligated and no attempt made to extract the placenta. Within a short space of time—on an

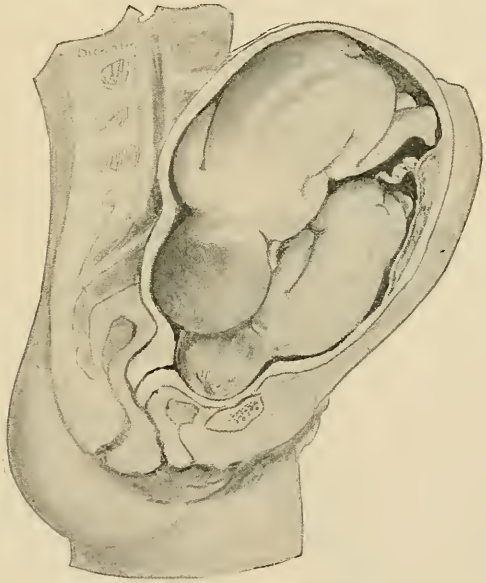

FIG. 135.—Twins, both heads presenting (Dickinson).

average not more than from twenty to forty-five minutes—the labor-pains return; the os, which has partially recontracted, dilates and the second bag of water presents; this second labor, the presentation being normal, is much easier than the first. Upon the delivery of the second child the two placentæ appear and labor is terminated. It is unusual for separation of the first placenta to occur before delivery of

the second child; hence there is, as a rule, no hemorrhage during the progress of the labor. In those cases, however, in which the two fetuses and their membranes and appendages are quite distinct, the fetus first presenting may be delivered with its appurtenances in its entirety; this happening, the interval elapsing before the birth of the second child may be quite protracted, even, though rarely, amounting to days or weeks (as in certain reported cases of superfetation). The third stage of labor is likewise protracted on account of the atonic condition of the uterine walls; hence the danger of hemorrhage during this stage of the labor and subsequently.

Mechanism of Plural Births.—A question of considerable interest concerns the positions occupied by the two fetuses and the order of their delivery. The possible presentations in their order of frequency are as follows (the percentages are those given by Hirst): Both fetuses present by the head (Fig. 135) in 49 per cent. of the cases; one presents by the head and one by the breech (Fig. 136) in 31.7 per cent.; both present by the breech in 8.6 per cent.; one by the head and the other transversely in 6.18 per cent.; one by the breech and one transversely (Fig. 137) in 4.14 per cent.; and both transversely (Fig. 138) in 0.35 per cent. The cause of the frequency of abnormal positions (almost 50 per cent. of the cases) is the distortion of the uterine cavity resulting in an increase in its transverse diameter, and lack of room for the

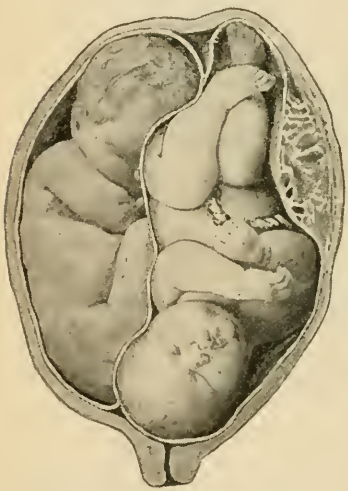

FIG. 136.—Twins, head and breech presentation (Dickinson).

two fetuses in normal positions, the second fetus having to accommodate its position to the space allotted it. When both heads present, they usually lie in the oblique diameters of the pelvis, with the occiput anterior (L. O. A. and R. O. A.), more room thus being afforded. The *order of delivery* also varies. Thus, when both heads present, it is usually the larger that is delivered first; if one presents by the breech and the other by the head, the latter is generally the first expelled; and if one presents transversely and the other longitudinally, again the latter almost invariably appears first.

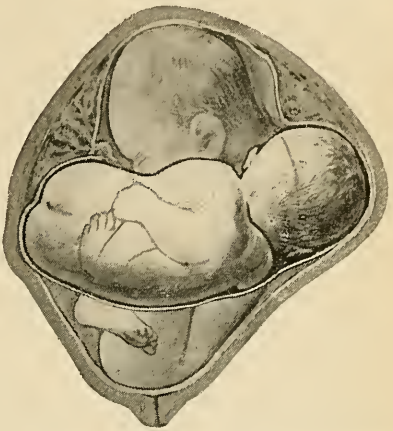

FIG. 137.—Twins, breech and transverse presentation (Dickinson).

Management of the Labor.—The first child presenting normally, active interference on the part of the accoucheur is not indicated until the delivery of the fetus. After ligation of the cord, if it be found that the uterus contains another fetus, a vaginal exploration should be made with the object of ascertaining the presentation of the second child. If a transverse position of this fetus be discovered, version, either cephalic or podalic, must be performed, and 1 or 2 drams of the fluid extract of ergot administered to the mother in order

FIG. 138.—Twins, both transverse (Dickinson).

to stimulate the exhausted uterus to contract, and nature permitted to terminate the labor. Only when hemorrhage occurs, or when there appear other signs of maternal or fetal danger, should the labor be terminated rapidly by forceps or completed version. If the second labor be unduly protracted, the attendant may rupture the membranes and employ frictions over the fundus uteri. After the delivery of the secundines a second large dose of ergot should be administered and a firm compress and abdominal binder applied. The subsequent treatment is that of a simple labor.

Complications of Plural Births.—Twin pregnancies are especially liable to the development of perplexing complications during the progress of labor. Among the most important of these may be mentioned: (1) *Compound Presentations.*—Not rarely there may be manifested a tendency for both fetuses to engage simultaneously in the superior strait of the pelvis; if this should occur, the indication is to favor the descent of the more important part, at the same time retarding the engagement of the other. Thus, there might be found—(*a*) A *double head presentation.* In this case the hand may be introduced into the vagina and the head highest in the pelvis pushed back; forceps must then be applied to the lower head and traction exerted until it become fully engaged, when a return of the complication will be impossible. (*b*) *Double footling presentation.* In a case in which all four feet are found in the parturient canal, those belonging to one fetus should be dragged down, so as to secure a breech presentation of that child, while the extremities of the other fetus may be pushed up to afford room for the descent of the breech. (*c*) *Presentation of a head and an extremity.* In such a case efforts must be made to displace the limb, while the head should be forced down by pressure from above or by traction with forceps. (2) *Malpresentations.*—A transverse presentation (occurring in 10 per cent. or more of the cases) must be treated, as in simple labor,

by podalic version. (3) *Coiling or Twisting of the Cords.*—Should the cord be coiled around one of the fetuses, preventing its descent, efforts must be made to relax it so that the encircled portion may be released: this failing, the cord must be ligated in two places and severed between the two ligatures, and the fetus delivered rapidly in order to avoid asphyxiation. (4) *Locking of the Twins.*—A serious complication of multiple pregnancy is that in which the two fetuses become so wedged together that the further advance of either is rendered impossible. This may result in a number of ways: (*a*) There may be an *engagement and interlocking of both heads.* The head of the first child in these rare cases has entered the pelvis; the head of the second child then engages at the pelvic brim together with the neck of the first child; further descent causes simultaneous engagement of the thorax of the first and the head of the second child, and these become tightly jammed into the pelvic cavity, so that further progress is arrested. *Treatment.*—Under these circumstances unlocking is generally out of the question, and craniotomy is indicated upon the head of the second child, with an effort to save the other fetus by means of the forceps; after its delivery the body of the second child must be extracted. (*b*) There may be a *locking of the head or breech with a transverse presentation.* The child presenting in the longitudinal axis may have been partially delivered, when further descent is blocked by a partial engagement of the transverse fetus; if this should occur, it will be the head of the first child in a breech presentation, or the shoulders in a cephalic presentation, that will be detained above the pelvic canal, the fetus lying transversely being driven firmly against the neck of the longitudinal fetus in either case. An examination through the vagina, aided by manipulations from above, will reveal the condition of affairs. *Treatment.*—(1) An effort must be made to dislodge the transverse fetus; if this prove successful, traction upon

the longitudinal fetus, either by the head or by the feet, will cause its descent; version must then be performed on the second fetus. (2) This failing, if the fetus first presenting be dead—as shown by absence of pulsation in the cord—decapitation may be performed; the second child may then be delivered by version, after which the retained portion of the first child must be extracted. (*c*) *Interlocking of the Chins.*—This, the most common variety of locking of twins, occurs when one fetus presents by the breech and the other by the head; after the delivery of the thorax of the first child further progress may be arrested, when digital examination will show that the head of the second child has descended into the hollow of the sacrum, while the head of the first is detained above the pelvic brim, the chins of both fetuses being in contact and a face directed to each thorax (Fig. 139). *Treatment.*—(1) The chins must be disengaged, if possible: this may be accomplished by pushing up the head of the breech presentation and at the same time pushing aside the head of the second child: if this maneuver succeed, the first child must be dragged down to prevent a recurrence of the condition. Rigid contraction of the uterus contraindicates such a proceeding. (2) If the first fetus still be living, forceps must be applied to the head of the second child and an effort made to drag it down past the thorax of the breech presentation. (3) This failing, if the first fetus be dead it must be decapitated and the second

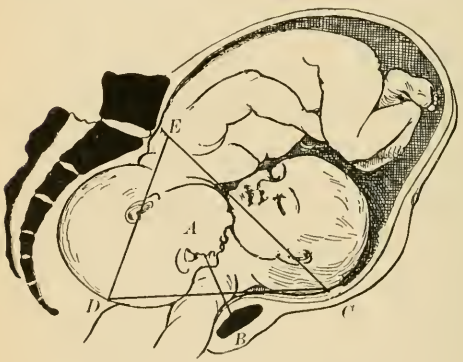

FIG. 139.—Locking of heads in twin labor.

child delivered by forceps: if life still exist, it is yet preferable to destroy the first child, since its chances of living through the obstetric performances that will be necessitated are much less than those of the second child. (*d*) *Interlocking of the Occiputs.*—In this condition the occiput of each fetus is jammed into the nape of the neck of its fellow. The *treatment* of such a complication is the same as for the preceding. Other varieties of locking are when the chin of one fetus fits into the nape of the neck of the other, or the head of the one is pressed against the lateral cervical region of the other. These cases must be dealt with according to the judgment of the operator. (*e*) *Placenta Prævia.*—This is an exceedingly rare complication of twin pregnancy. The reason that has been advanced for this rarity (Herman) is that the condition of the endometrium, preventing the ovum from becoming imbedded in the proper place, will, if two ova enter the uterine cavity, probably lead to the escape of one of them altogether. When it does occur, both placentæ, being situated in a dependent portion of the uterus, are expelled immediately after the delivery of the first child. The second fetus almost invariably perishes as a result.

(2) **Dystocia due to Malformations and Diseases of the Fetus.**—(*a*) *Over-size of the Fetus.*—A common cause of difficult labor of fetal origin is over-size of an otherwise absolutely normal fetus: especially is this instrumental in the development of dystocia when there coexists a minor degree of pelvic contraction that would, in all probability, escape detection upon superficial examination, and only becomes evident because of the fetal abnormality. The *causes* of excessive size of the fetus are multiparity, prolongation of pregnancy, large size of one or both parents (especially of the father), and advanced age of either parent. It is a curious clinical fact that with each successive pregnancy a woman is very liable to give birth to increasingly heavy children: in this manner may be produced at the third or

fourth labor a degree of dystocia sufficient to necessitate the employment of forceps or even some graver obstetric operation. The continued growth of the fetus while *in utero* renders any considerable prolongation of pregnancy a matter of serious import to the mother. For this reason it has been deemed advisable by various obstetric authorities to artificially terminate a pregnancy that has extended a fortnight beyond the normal duration of forty weeks. Even after the birth of the head the large size of the bisacromial diameter may cause considerable difficulty at the time of the delivery. The *treatment* of such cases, if spontaneous labor be impossible, is the application of the forceps or the performance of version or of symphysiotomy, although the latter procedure will very rarely be indicated. When impaction of the shoulders occurs in these cases, the body may be delivered in the manner described on page 170, or the finger may be hooked into the anterior axilla and forward rotation accomplished, when the anterior or posterior arm, as is most convenient, may be delivered; care must be taken to avoid fracture of the humerus in performing this maneuver. In very difficult cases the blunt hook may be used in the axilla, and it may even become necessary after fetal death to puncture the chest.

(*b*) *Premature ossification of the fetal skull* is a complication of labor occurring in a small proportion of cases. Owing to the incompressibility of the skull, moulding of the latter cannot occur—hence the subsequent dystocia. Cerebral development is very usually interfered with when this premature ossification occurs, and in marked cases of this form of fetal dystocia the question of craniotomy must be seriously considered. For the minor degrees of ossification the forceps will usually answer.

(*c*) *Fetal Malformations and Monstrosities.*—Deformities of the fetal body must of necessity radically alter the mechanism of labor, and in many cases even render the spontaneous discharge of the fetus impossible. The varieties of

fetal malformation most frequently concerned in the production of dystocia are double monsters, and, of single monstrosities, the anencephalic fetus. In *anencephalus*, the most common monstrosity, the dystocia arises from the unusual breadth of the shoulders, together with varying degrees of hydramnios (which is always present), malpresentations (transverse, face), and compound presentations (an extremity with the diminutive head). Usually the base of the skull presents, the diagnostic feature being the sella turcica situated centrally. The only *treatment* for anencephalus is some form of embryotomy, either thoracic evisceration or amputation of an extremity. Double monsters may constitute a very serious obstruction to labor. Generally the diagnosis of the condition cannot be made prior to labor. Under these circumstances the proper course of treatment, should obstruction occur, is to perform podalic version, since it has been found that such fetuses are best delivered feet first. If this be impracticable, some form of embryotomy, as evisceration or amputation, must be performed. Fortunately, premature expulsion is the rule in these cases, and the small size of the fetuses obviates most of the difficulty that would otherwise ensue.

(*d*) *Pathologic Over-size of the Fetal Head.*—This includes the two forms of intracranial disease, congenital hydrocephalus and congenital encephalocele, cerebral meningocele, or hydroencephalocele. (1) *Congenital Hydrocephalus.*—A complete summary of this interesting condition has been given in the section on fetal pathology (see page 312). It remains merely to mention its causative relationship in the production of fetal dystocia. It is impossible to diagnose the condition prior to the onset of labor. When a woman bearing a hydrocephalic child falls into labor, the symptoms of obstruction are very shortly manifested: the pains, at first normal in character, become violent and tetanic; the head fails to advance, and a gradual rise in the position of the contraction-ring of Bandl occurs. A diagnosis may

now be made, as a rule, without much difficulty, by digital exploration and abdominal palpation. The vaginal finger distinguishes bulging fontanels and widely-separated sutures, both yielding the sensation of fluctuation: this bulging of the fontanels may become so pronounced as to give the same characteristic features as a bag of waters. A supplementary fontanel may in certain cases be detected midway between the bregma and the posterior fontanel. Occasionally by a combined examination it is possible to elicit a crepitation by rubbing the cranial bones together. There may also be noted an unusual prominence of the frontal and parietal bones. *Abdominal palpation* reveals an unusual size of the head, which generally rests just above the pelvic brim; occasionally a breech presentation may be encountered, but very rarely does the hydrocephalic fetus lie transversely *in utero*. The prognosis is very grave for the fetus and grave for the mother; the fetal mortality is over 80 per cent., and the maternal about 18 per cent. The maternal dangers are hemorrhage, exhaustion, rupture of the uterus, vaginal and perineal lacerations, vaginal fistulæ, and sepsis. Occasionally, when the cephalic distention is very extreme, the thin walls of the cyst rupture under the pressure of the labor-pains, and the fluid escapes into the cellular tissue under the scalp, between it and the cranial bones; the head then collapses and is readily discharged by nature. This is an unusual termination. *Treatment.*—If the fetus still be viable, the enlarged fontanel or suture should be tapped aseptically, the fluid drawn off, podalic version performed, and the child rapidly delivered in order, if possible, to preserve its life. While it is possible that this procedure may be successful, the child will probably survive only for a few weeks or months, and ultimately perish from the disease of the brain that primarily produced the hydrocephalus. Generally, craniotomy with forceps-delivery is indicated in order to avoid serious maternal consequences. In those cases in which the breech presents perforation must be

made through or near the foramen magnum, or the spinal column may be opened and the contents of the cerebral ventricles drained off through a hard-rubber catheter passed up into the brain (Fig. 140). (2) *Encephalocele*, *meningocele*, and *hydroencephalocele* do not often seriously complicate labor: the growths are either of such an insignificant size or so situated (in the occipital region or immediately over the root of the nose) that they do not materially impede the progress of labor; their easy de-

FIG. 140.—Tapping a hydrocephalus through the spinal canal (Dickinson).

livery is, moreover, favored by the compressibility of the tumor and of the cranial bones themselves, which very generally appear to have undergone some process of

osteomalacia or other degenerative change, whereby they are rendered much softer than normal. Should obstruction to labor occur, it will become necessary to perforate the tumor and draw off its contents, reducing thereby its bulk and rendering its delivery possible. This need not necessarily result fatally to the fetus if proper aseptic precautions be taken.

(*c*) *Tumors of the Fetal Trunk.*—Certain tumors situated on or within the fetal trunk may by their bulk and situation induce a very serious form of fetal dystocia. Prominent among these growths may be mentioned spina bifida; teratomata situated on the jaw, spine, or orbit; congenital herniæ of the viscera through clefts in the abdominal or thoracic walls; general anasarca; hydrothorax; ascites; hygromata or fibromata; cutaneous emphysema; syphilitic or malignant (sarcomatous) changes in the liver, pancreas, spleen, or kidneys; enlargement of the fetus from retention of secretions or by congenital tumors; distention of the urinary bladder; and cystic disease of the kidneys. Should spontaneous delivery be impossible under any of the foregoing conditions, forceps, or version or some form of embryotomy—usually evisceration or removal of the tumor in segments—will be indicated. Tumors or cysts with fluid contents may be reduced in size by aspiration, as may also thoracic or abdominal enlargement due to serous effusions. General anasarca and cutaneous emphysema will largely disappear after multiple punctures of the skin. The skin of an emphysematous fetus presents a translucent and glistening appearance, and pressure thereon elicits crepitation. After puncture of the skin to permit the escape of the putrefactive gases, the scalp should be perforated and the fetus delivered by the craniotractor. Cystic disease of the kidneys and distention of the urinary bladder may induce such extreme distention and distortion of the trunk as to give to the fetus a most curious appearance and to almost destroy all semblance to humanity. The kidneys under

such circumstances are converted into an immense conglomeration of cysts, and the abdomen is so increased in size that it cannot engage in the parturient canal. Children so deformed usually present by the head, more rarely by the breech, and occasionally transversely. *Treatment* consists in perforation of the trunk, evacuation of the fluid contents, and evisceration if this be required.

(*f*) *Fetal Death and Subsequent Rigor Mortis.*—If the fetus die during or immediately before the onset of labor, a condition of rigor mortis may set in and temporarily arrest the progress of labor. Under such circumstances forceps must be applied and the fetus extracted.

(3) **Dystocia due to Abnormalities in the Fetal Appendages.**—(*a*) *Dystocia due to Abnormalities in the Membranes.*—(1) *Dry Labor.*—A dry labor is one in which there is a deficiency of the liquor amnii or in which there has occurred a premature rupture of the bag of waters—*i. e.* before complete cervical dilatation has been accomplished. When this occurs the hydraulic action of the liquor amnii is absent, and in consequence labor is retarded and the maternal sufferings materially increased. As a rule, rupture of the cervix follows in varying degrees, and the woman may manifest considerable exhaustion. If labor have been much protracted, the treatment, after thorough dilatation of the os, is delivery by the aid of the forceps. (2) *Increased Tenacity of the Membranes.*—Occasionally the membranes are of much greater density than normally, and do not rupture after the os has become thoroughly dilated. They may remain intact until the entire fetus has been born; more commonly they rupture high up, as around the fetal neck, and the head is delivered surrounded by a cap of membranes: when this happens the child is said to be *born with a caul.* The membranes must be removed at once to permit of the establishment of respiration.

(*b*) *Dystocia due to Abnormalities in the Funis.*—The cord may be either too long or too short; in the former case

prolapse may occur; in the latter the advance of the fetus is retarded. The *diagnosis* of too short a cord is attended with considerable difficulty, and is mainly based upon the ineffectual nature of the labor-pains—which may be of normal intensity or even exaggerated—and upon the non-advance of the presenting part: there may be a decided retraction of the presentation after each uterine contraction. The *dangers* of this condition are rupture of the cord, fatal compression of the fetus, premature detachment of the placenta, inversion of the uterus, maternal exhaustion, and ascent of Bandl's ring. *Treatment* consists in rapid delivery of the fetus by the forceps or by podalic version.

(*c*) *Dystocia due to Placental Abnormalities.*—(1) *Placenta prævia* has already been mentioned under the hemorrhages of pregnancy (see page 345). (2) *Retention of the Placenta* is a condition due to a temporary paralysis of the uterine muscles, or to failure of the lower uterine segment to maintain its normal condition of distention until the escape of the placenta. In the former case digital exploration will reveal the detached placenta resting just within the internal os or even protruding into the cervical canal. In the latter case—the so-called *hour-glass contraction of the uterus*—there is a retention of the placenta, that may or may not be adherent, above the ring of Bandl, which appears to be in an abnormal state of contraction. The theory given in explanation of this condition—which is undoubtedly, though rarely, encountered—is failure of the normal inhibition of the circular muscular fibers of the lower uterine segment, it may be from the improper use of ergot during labor, and the upper segment failing to contract on account of the presence within it of the retained placenta. Duncan termed this condition *hour-glass relaxation* of the uterus. Digital exploration traces the cord up to this contracted ring, the placenta lying above. The hemorrhage attendant upon simple retention of the placenta is slight. The *treatment* consists in the application of Credé's method of extraction,

aided, in the case of hour-glass contraction, by digital dilatation of the contracted fibers and slight traction upon the funis. (3) *Adherent placenta* is that serious condition in which either the entire, or, more generally, a portion of the placenta, is closely attached to the uterine walls, preventing proper contraction of the latter. This is a grave condition occurring about once in 300 cases of labor. The *cause* is generally some form of inflammation (often syphilitic) of the deciduæ or placenta, resulting in the formation of dense bands of fibrous tissue and an intimate union between the placenta and the uterine walls; the parts of the placenta not bound down in this way separate under the influence of the uterine contractions, the uterine sinuses are thus opened, and alarming hemorrhage, which may even prove fatal, results. Digital examination fails to detect the placenta in the lower uterine segment, while abdominal pal-

FIG. 141.—Detachment of the placenta.

pation shows the fundus to be quite enlarged. The *prognosis* is grave. Death may occur from hemorrhage or from septicemia (in about 7 per cent. of the cases). The *treat-*

ment must be energetic, and consists in immediate removal of the adherent organ. Using the funis as a guide, the fingers, arranged in the shape of a cone, are introduced through the contracted lower uterine segment and carried to the fundus uteri, counterpressure being made from above with the external hand. The fingers should be inserted between the placenta and the uterine wall, and the former rapidly separated; it must then be grasped in the hand (Fig. 141), and removed while energetic frictions, according to Credé's method, are maintained by the external hand. Thorough antisepsis must be observed to prevent subsequent infection.

(4) **Dystocia due to Fetal Accidents.**—(*a*) *Funic Presentation* (*Chorda Prævia, Prolapsus funis, Prolapse of the Cord*).—This consists in a descent of a loop of the umbilical cord in advance of the presenting fetal portion (Fig. 142).

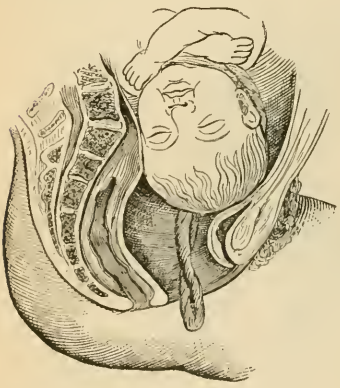

Fig. 142.—Prolapse of the cord.

Varieties. — There are included under this heading, as described by Herman, three distinct conditions, as follows: (*a*) True *chorda prævia*, in which from the very beginning of labor the cord presents at the superior strait; (*b*) *prolapse of the cord*, or a carrying downward of the cord with the gush of the liquor amnii at the time of the rupture of the membranes; (*c*) *expression of the cord*, a condition occurring late in labor, and signifying a forcing downward of a loop by the side of the presenting fetal head that has already become engaged. The ultimate result of all these conditions is the same; hence they may well be considered together. *Frequency.*—Funic prolapse occurs about once

in from 200 to 300 cases of labor; it is therefore a not very infrequent complication. *Etiology.*—The causes of the prolapse may be fetal or maternal. The *fetal* causes are—(*a*) *certain malpositions and malpresentations*, as posterior position of the occiput; presentation of the trunk, the face, the brow, and the breech; multiple pregnancy, and complex presentations; (*b*) *under-size of the fetal head*, as in premature labor; (*c*) *anomalies of the fetal appendages*, as hydramnios; sudden escape of the liquor amnii, especially when the patient is standing; excessive length of the cord; marginal attachments of the cord; placenta prævia. The *maternal causes* are various degrees of contraction of the pelvis, preventing exact coaptation of the presenting part to the pelvic brim; multiparity (the relaxed abdominal walls permitting a retraction of the presenting part from the pelvic inlet); pendulous abdomen; uterine fibromata and myomata, causing malpositions and malpresentations of the fetus; and lateral obliquity of the uterus. *Diagnosis.*—As a rule, funic prolapse may easily be recognized after rupture of the membranes has occurred; prior to the escape of the liquor amnii it is difficult to detect, since the cord, on account of its nonresisting nature, recedes before the examining finger, and is therefore practically out of reach: the main point of diagnosis then lies in the discovery of the pulsations. Even after rupture of the membranes has occurred the cord has been mistaken for a prolapsed loop of intestine by inexperienced observers. The characteristic substantial feel of the cord, together with its appearance, the normal twists, the funic pulse, and the fact that the bowel has a mesenteric attachment while the cord has none, should make such an error in diagnosis almost impossible. The usual position for the cord to occupy is in one or the other side of the pelvic cavity; very rarely it will lie either in front of the sacral promontory or directly back of the symphysis pubis: in these positions there is increased danger of compression by the fetal parts. *Prognosis.*—The maternal prognosis is

not affected by funic prolapse, save that there is an increased danger of sepsis consequent upon the manipulations necessary in the proper management of the case. The fetal prognosis, however, is very grave, the mortality rising to between 50 and 55 per cent., and being higher in primiparæ, in those cases in which the fetus offers by the vertex, in over-size of the fetus, and when rupture of the membranes has occurred early. The *cause* of fetal death is occlusion of the fetoplacental circulation from compression of the cord, resulting in asphyxiation of the child. Should the funis show an absence of pulsation for a period of ten or fifteen minutes, and the fetal heart-beats cannot be detected by abdominal auscultation, death of the fetus may be assured. *Treatment.*—This is an important matter, varying with the time at which the prolapse has occurred. (1) *Prior to Rupture of the Membranes.*—This is the most favorable period in which to treat the case, for as long as the membranes are intact there is but a minimum amount of pressure exerted upon the cord and fetal life is not jeopardized. The indications for treatment, therefore, are: (*a*) *preservation of the membranes* as long as possible; (*b*) *replacement of the prolapsed cord by the postural method.* The woman should be made to occupy the genupectoral posture for from twenty to thirty minutes: while in this position the cervix uteri is most elevated, while the fundus uteri is placed almost vertically beneath it; generally under the influence of gravity the movable cord will slowly settle to the fundus, and the abnormal condition will correct itself. During the intervals between the pains the cord may be gently pushed back with the hand, care being taken to preserve the integrity of the membranes. Digital exploration showing an absence of the cord, the woman should slowly turn over into the Sims posture, and rest upon the side opposite to that occupied by the funis; this will favor entrance and engagement of the presentation in the superior strait, when the funic prolapse cannot be

reproduced; the membranes should then be ruptured and nature allowed to terminate the labor. The *advantages* of this method of treatment are—(*a*) Preservation of the membranes; (*b*) the avoidance of protracted manipulations; (*c*) retardation of labor, thus affording the cord an opportunity to recede from its unfavorable position. (2) *After Rupture of the Membranes.*—The indications for treatment, under these circumstances, are likewise two in number—namely, if the fetus be living, *replacement of the cord*, or, this failing, *speedy delivery of the child.* If the child be dead, noninterference is the course to pursue. (*a*) *Replacement of the Cord.*—Various methods of replacing a prolapsed cord have been suggested: (1) If the patient be seen shortly after escape of the liquor amnii, the *postural method* may again be of service. In order to succeed with this it will often become necessary to push up the presenting part, that room may be afforded to return the prolapsed cord. (2) *The Manual Method.*—The patient must be placed either in the Sims or the genupectoral posture, preferably the latter; an anesthetic is unnecessary. The cord is grasped by the fingers, and in the intervals between the pains is replaced within the anterior portion of the uterus by a process of taxis: it should be manipulated as little as possible, to avoid disastrous effects upon the fetal circulation. It should be carried well above the presenting part, that a return of the condition may be impossible. If the maneuver prove successful, the presenting portion of the fetus must be pressed into the superior strait and retained there by means of a compress and a tightly-applied abdominal binder. (3) *The Instrumental Method.*—The only instrument required for this operation is a hard-rubber catheter. A counteropening may be made in this, and through the two fenestra a loop of tape passed: if desired, a steel stylet may be inserted into the catheter, and around it a loop of tape secured; or, finally, the tape, folded upon itself, may be passed through the instrument, the ends being introduced above at the eye

and caused to emerge at the upper end of the catheter: whichever method may be chosen, the loop must be long enough to permit of its being hooked over the upper extremity of the catheter after encircling the prolapsed loop of cord. The patient then being placed in the genupectoral position, or, if anesthetized, in the Sims posture, the prolapsed cord is secured to the catheter in the manner mentioned, and the whole carried up into the uterine cavity; the instrument may then be withdrawn, the loop slipping off the upper extremity; or it may be left in the uterine cavity without fear of danger. As before, the presenting part should be made to engage to prevent a return of the condition. (4) *Podalic Version.*—The foregoing methods failing, rapid delivery of the fetus is indicated, and this can best be accomplished by podalic version: the condition then resolves itself into an ordinary breech presentation, and should be so managed. (5) *Delivery by the Forceps.*—This method is not so favorable for the fetus, but is necessary when the prolapse occurs after engagement of the head. The cord must be placed at that sacroiliac synchondrosis not occupied by the fetal head—where it will be least subjected to pressure—and delivery rapidly accomplished by the Simpson or the axis-traction forceps.

(*b*) *Rupture of the funis* is a rare complication of labor in which, during the process of parturition, the continuity of the cord is destroyed. The *causes* of this accident are abnormal insertion of the cord into the placenta (the velamentous insertion or the mesocord); unusual shortness of the cord, either a congenital condition or one produced by repeated coiling of the funis about the fetus; and precipitate labor, the fetus being expelled while the mother is standing or stooping. It is a serious condition for the fetus, almost invariably resulting in its death from shock or asphyxiation, and but very rarely from hemorrhage. Bleeding does not occur, because of the retraction of the severed vessels and closure of their mouths by an over-

lapping of the jelly of Wharton. Should rupture of the funis occur before the birth of the child, the latter should be delivered speedily either by version or by the forceps.

(*c*) *Decapitation of the fetus* is a rare accident resulting from too vigorous efforts at delivery of the after-coming head either in a normal breech presentation or after the performance of version. The retained head must be extracted by the forceps or the craniotractor, pressure being exerted from above to hold it secure during the application of the instrument. The maternal tissues may be lacerated by spiculæ of bone if proper precautions be not observed.

(*d*) *Avulsion of the Fetal Extremities.*—Only in the case of a premature or a partially macerated fetus can an extremity be forcibly torn from the trunk. Should such an accident occur, the remainder of the body must be promptly extracted and an intrauterine douche of a 1 per cent. solution of creolin given.

2. Maternal Dystocia.

The causes of difficult labor, maternal in origin, may be grouped under the four headings—Precipitate labor, Protracted labor, Obstructed labor, and Maternal accidents.

(1) **Precipitate Labor.**—By a *precipitate labor* is meant one in which the expulsion of the fetus and its appendages from the parturient canal is accomplished with unusual celerity, either with or without much suffering on the part of the woman. *Etiology.*—This condition can result in one of two ways. In the first place, there may be an *excess in the expulsive powers of labor*, and, in the second place, these being normal, there may be a *deficiency in the resistant powers;* in either case the fetus is speedily propelled through the parturient canal with more or less detriment to the mother or the child. The increase in the expulsive power may be altogether involuntary—that is, uterine in origin, this being quite rare and only encountered in primiparæ—or it may be more or less voluntary, and is then due

to excessive use of the abdominal muscles and diaphragm during the second stage of labor. Excessive uterine contraction may be encountered in young and delicately-constructed girls, as well as in those of a more advanced age and robust muscular build: it should therefore be considered as a manifestation of superabundant nerve-action of sympathetic origin, rather than an outcome of over-muscular development. The deficiency in the resistant forces may be the result of a number of conditions. In the first place, the fetus itself may be at fault: either it is an undersized and puny child, or else the labor is occurring prematurely and the fetus has not attained its normal bulk and dimensions. On the part of the mother it may be an outcome of some abnormal condition in the parturient canal. The pelvis itself may be over-sized and roomy; its axis may be unusually straight, as when the normal amount of sacral curve is absent; it may be the seat of certain deformities increasing its caliber above the normal; or there may have occurred at some previous parturition an extensive laceration of the cervix or of the pelvic floor, so that the advancing child is not directed forward throughout the full length of the parturient canal below the hard structures, but emerges suddenly through an orifice where normally the perineum should exist. The varieties of pelvic deformity conducive to speedy delivery of the child are the justomajor, the split pelvis, the advanced stages of the osteomalacic pelvis (the bones having become so soft that, although considerably distorted, the simple pressure of the child's head is sufficient to straighten the canal, and the fetus is driven forcibly through), and those pelves in which the synchondroses are not possessed of a normal degree of tenacity, so that the pressure exerted by the fetus produces separation of the bones: this is most likely to occur at the symphysis pubis, but the sacroiliac synchondroses may also yield.

The *justomajor*, *generally equally enlarged* (*pelvis æquabiliter justomajor*), or *giant pelvis* is one characterized by

an over-size of all its diameters, with, however, preservation of the normal proportions. Such a pelvis, unless very much above the normal in size, may readily be overlooked. During the progress of gestation in these cases there is very likely to be a marked exaggeration in the pressure-symptoms; this follows the extreme descent of the uterus into the pelvic cavity, more room being afforded there for its development than is ordinarily the case; an irritable bladder, obstinate constipation, edema of the vulva, and pronounced varicosities may attend the pregnancy.

In a *split* or *inverted* (Ahlfeld) *pelvis* (Fig. 143) the deformity is usually situated at the symphysis pubis, although

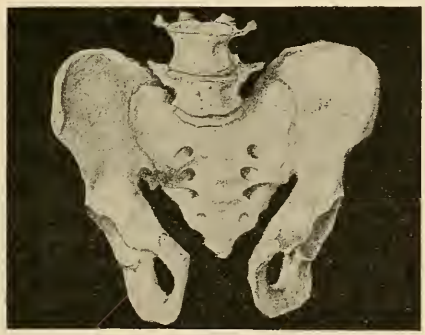

FIG. 143.—Split pelvis (Schauta).

more rarely there may exist a congenital fissure of the sacrum and of the lower portion of the vertebral column. When the defect is situated anteriorly, the innominate bones, from the upward pressure of the femora, are rotated outward and backward, so that there occurs an approximation of the posterior superior iliac spines behind the sacrum, which bone is also displaced inward to a certain extent; in this way a groove is formed posterior to the sacrum; hence the name *inverted pelvis.* Generally the osseous defect is supplied by a certain amount of fibrous tissue; there are often associated other congenital defects, as exstrophy of the blad-

der. It is rare for conception to occur in this condition, and Klein states that but six such instances are recorded in medical literature. When the sacrum is cleft a meningocele often projects into the pelvic cavity, and this may seriously obstruct labor.

Diagnosis of Precipitate Labor.—Occasionally the fetus is expelled with such rapidity—there occurring but one or two pains of any severity—that the condition becomes self-evident. These women are probably apathetic in nature, and, not experiencing much pain, are not aware of the extent to which labor has advanced. In other cases, in which the delivery is not accomplished so speedily, the patient suffers severely from exaggerated intensity of the pains, which are frequent in occurrence and prolonged beyond the normal duration. *Vaginal examination* in such cases reveals a steady and rapid advance of the presenting portion, while palpation of the abdomen shows an almost tetanic action of the uterine muscle or a forcible contraction of the abdominal walls. *Prognosis.*—The consequences of precipitate labor, while often insignificant prove quite serious. The *dangers* to the fetus are asphyxiation from rupture of the cord or premature detachment of the placenta, and injury from a fall upon the floor or into a commode; the *maternal dangers* are hemorrhage from premature detachment of the placenta, fatal syncope from sudden evacuation of the uterine contents, inversion of the uterus, laceration of the cervix or perineum, and postpartum hemorrhage. *Treatment.*—The management of precipitate labor includes the establishment of thorough mental and moral control over the patient, as well as the employment of remedies and measures to reduce the violence of the pains and to resist the too rapid expulsion of the fetus. When the voluntary muscles are brought strongly into play, their action may be inhibited by commanding the patient to open her mouth and to avoid efforts at straining. If the pains become exaggerated, especially in the early

stages of labor, they may be reduced in intensity by the judicious administration of small doses of the bromids or of opium, or *Playfair's treatment* may be instituted for the purpose of lessening the rigidity of the cervical tissues. This consists in the exhibition of a large amount of chloral hydrate within a short space of time; thus, three doses of 15 grains each may be given at intervals of fifteen minutes. The drug when thus administered deadens the patient's sensibility to a considerable degree, induces rapid softening of the cervical tissues, and renders the woman's condition so much the more tolerable. After the head has reached the pelvic floor, should rupture of the perineum appear imminent, the rapid advance of the presenting part may be prevented by direct pressure by the thumb of the accoucheur, or Sawyer's short straight forceps may be applied and the progress of the head thus controlled. Occasionally the rapidity of the labor may be considerably lessened by placing the patient in the genupectoral position, and while she is thus reclining allowing the child to be born: gravity is called into play here, as the advancing fetus must be driven up an inclined plane (the anterior uterine wall) in order to reach the lower portion of the parturient canal. Only rarely are inhalations of chloroform or ether demanded, and then in exceedingly hypersensitive individuals.

(2) **Protracted or Retarded Labor.**—By a *protracted*, *retarded*, or *tardy* labor is meant one that is considerably prolonged beyond the ordinary limit of normal parturition—namely, from ten to twenty hours in primiparæ and from two to six hours in multiparæ. Upon the degree of prolongation and upon the stage of parturition in which it occurs will depend the gravity of the condition, but under all circumstances it is a more or less serious matter, involving risks to both mother and fetus. Should the delay occur before the second stage of labor, as in all instances of breech presentation, beyond the increased suffering of the mother usually no untoward effects will follow. Undoubt-

edly, an unusual prolongation at this time will render the patient less fit to endure the agong of the more active stages of parturition, and may induce extreme exhaustion, and thus, indirectly, some of the graver accidents of labor and the puerperium. Of much more serious import is a delay occurring after cervical dilatation has been accomplished: a protracted second stage of labor very generally indicates an insuperable obstruction to the progress of the fetus, and this constitutes not a protracted or hard labor, but a true *obstructed labor*. The *symptoms* of a protracted labor are increasing maternal exhaustion, elevation of temperature, a rapid pulse (110–120), nausea and vomiting, restlessness and irritability of the patient, thirst, anorexia, a harsh, dry, and heated feel of the skin, and a decrease or absolute suppression of the quantity of vaginal secretions, the vagina becoming dry, hot, and hypersensitive. The fetus also manifests signs of exhaustion, as indicated by a primary increase in the pulse-rate, followed by a slowing, weakening, and irregularity of the heart's action, and finally by death, if the labor be not terminated. The *dangers* of protracted or obstructed labor are fetal and maternal. The *fetal dangers* are—(1) Asphyxiation from prolonged compression of the vital centers, from arrest of the placental function by partial separation of that organ, or by a stoppage in its circulation from the tetanic uterine action, or from compression of the funis; (2) the subsequent development of an inspiration-pneumonia from spasmodic attempts at respiration while still within the parturient canal: the efforts at inspiration carry into the bronchial tubes irritating material from the uterus or vagina, and pneumonia results. The *maternal dangers* are—(1) Exhaustion and death; (2) pressure-necrosis, with the ultimate formation of vaginal fistulæ communicating with the rectum or bladder; (3) the development of septic changes from the subsequent atonic condition of the tissues and the operative manipulations that are necessary in order to ter-

minate the labor; (4) postpartum hemorrhage, a direct result of the atonic condition of the uterine muscle following a prolonged labor. The *cause* of protracted labor is some deficiency in the expulsive forces; in other words, it is the result of what is known as uterine or abdominal inertia.

Uterine and Abdominal Inertia.—By *uterine inertia* is meant that condition in which the uterine contractions are irregular, weak, and ineffectual, not sufficing to induce dilatation of the os or expulsion of the fetus. By *abdominal inertia* is meant a similar condition of the voluntary muscles of the abdominal wall, by which the woman is unable to aid the uterine contractions of the second stage of labor by effective bearing-down efforts. Abdominal inertia may be the result of some exhausting disease, as pulmonary tuberculosis or a recent attack of typhoid fever; it may come from a weakened state of the muscles induced by improper hygiene; or it may follow the inhibitory action of profound emotion, as shame or fear in the presence of the physician, or the intensity of the pangs of labor. Uterine inertia may appear in two forms, the primary and the secondary. The term *primary* or *true uterine inertia* designates that condition popularly known as "weak pains," in which from the very outstart of labor the uterine contractions have been few and far between, of but slight intensity, and utterly incapable of effecting any material progress in the expulsion of the uterine contents. This is essentially an unimportant condition so far as danger to the mother and child is concerned; there are no signs of maternal exhaustion, nor does the fetus appear to suffer any inconvenience from its slow progress into the world. In the course of some hours dilatation will be accomplished, the child will commence to descend the parturient canal, and will finally be expelled after two or three pains of somewhat greater severity. *Secondary uterine inertia*, or "*uterine exhaustion*," is quite another condition. Here labor has begun in a perfectly normal manner, and has progressed

through the stage of dilatation, and, it may be, until the fetal presentation is well distending the perineum and causing marked bulging of the vulvar orifice: suddenly the pains, that have been of normal or even of exaggerated intensity, die out, and labor apparently seems to be at an end without the accomplishment of its ultimate purpose —the expulsion of the uterine contents. The woman may even fall into a deep sleep for some hours; at the expiration of this time the pains will return with renewed or even increased severity, and speedy delivery will be accomplished. This is a condition of true uterine exhaustion, quite distinct from that which has just been described, in which at no time has the uterine action been sufficient to induce exhaustion or even a sense of fatigue.

Causes of Uterine Inertia.—The etiology of this condition is obscure: (*a*) Very often no appreciable causation can be discovered, and in such cases the inertia is said to be due to a peculiar *idiosyncrasy* of the patient, characterized by an apathetic condition of the uterine muscle, which, it may be, shares in a similar condition of the entire system. Such patients will in successive pregnancies manifest the same condition of inertia, and labor in them is unattended with intense suffering; (*b*) *advanced age* of the woman; (*c*) *multiparity:* inertia is much more frequent in multiparæ than in primiparæ; (*d*) *emotion*, especially in hysteric and neurotic females; thus the mere presence of the physician is sufficient to "frighten away the pains;" (*e*) certain local pelvic conditions, as over-distention of the bowel or of the bladder, which by pressure increase the sufferings of the patient and thereby inhibit the uterine contractions; (*f*) *temporary paralysis of the uterine muscles* from over-distention, as in the case of hydramnios or multiple pregnancy; (*g*) *any cause preventing the hydraulic action of the liquor amnii;* thus, should the membranes be more closely adherent than usual, they will fail to bulge to the normal extent into the cervical canal, and this, the most important

stimulus to uterine contraction, will be absent; (*h*) it may be that weakness of the uterine muscle from some chronic or severe acute disease, or from poor nutrition the result of improper hygienic surroundings, may contribute to the production of uterine inertia: such a cause, if it exist at all, is rare. Uterine inertia, like excessive uterine action, seems very frequently to be quite independent of the muscular development of the individual.

Clinical Manifestations of Uterine Inertia.—Clinically, a patient the subject of a true uterine inertia presents no symptoms other than a mere weakness of the uterine contractions. She is but little incommoded by the advent of her labor, and may even continue upon her feet after thorough dilatation of the os has been accomplished: a so-called precipitate labor may thus be engendered, due not to an actual increase in the expulsive power, but to ignorance on the part of the patient as to the extent to which the labor has progressed. Much more commonly, however, is the labor protracted, and the patient continues to experience her ineffectual pains until an artificial termination be made to her labor. There is no alteration in the pulse-rate, nor does the patient's facies present any trace of suffering.

Physical Signs.—Abdominal palpation reveals feeble uterine contraction, lasting but for a few moments, and followed by more or less complete relaxation of the uterine walls. Owing to a similar relaxation of the abdominal walls, the fetal outlines may be very distinct. The straining efforts during the second stage of labor may be entirely absent. Vaginal examination reveals a very slight advance of the presenting part during the height of the feeble contraction, and this will be followed by more or less retraction.

Treatment.—The treatment of this condition resolves itself into prophylaxis, and the treatment of the first and of the second stage of labor. 1. As regards prophylaxis, it has been clearly demonstrated by such men as Bell, Duff, and Edgar that strychnin administered judiciously during the

closing weeks of gestation will so give tone to the uterine muscles and nerves, as well as to the entire organism, as to result in powerful uterine contractions during the process of parturition. Under the use of this drug the appetite improves, digestion is facilitated, the bowels become more regular, insomnia is controlled, the circulation is improved, and labor is rendered more normal and less painful. Duff claims that after its use after-pains are not so frequent, and the danger of postpartum hemorrhage is greatly reduced. The strychnin may be administered in doses of from $\frac{1}{30}$ to $\frac{1}{20}$ of a grain three or four times daily. 2. As long as the os is undilated and the membranes unruptured there is no danger to the mother or to the child, and the accoucheur should content himself with inaction, merely making use of such measures as will conduce to the greater comfort of his patient. The old method of stimulation of the uterus to more forcible contractions by large doses of quinin not only contributes materially to the nausea, and thus increases the discomfort of the woman, but has failed repeatedly in producing the desired effect. Of much more service is the administration of nerve-sedatives, as chloral or the bromids, with the observance of rest and quiet and the favoring of sleep. It may be that by pursuing such a course as this the patient's system will be so stimulated that the intensity of the uterine pains may ultimately become materially increased. Food in small quantities at repeated intervals, together with a moderate amount of stimulation, as sherry wine, will also conduce to the same end. In the apathetic variety of inertia, in which the first stage of labor is inordinately prolonged, forcible injections of tepid water against the anterior cervical lip may be resorted to, the proper precautions being observed. Should the inertia be a direct outcome of hydramnios, simple rupture of the membranes will end the trouble, the pains assuming their normal intensity upon the escape of the liquor amnii. The application of a firm abdominal

binder will often, by straightening the uterine axis, materially shorten the duration of labor, as will also permitting the patient to walk about the room; the administration of a rectal enema or of a hot sitz-bath, the insertion of Barnes' bags, or the employment of a mild faradic current (one pole being placed upon the posterior cervical lip and the other over the fundus uteri, or, according to *Kilner's method*, one on each side of the uterus at a point midway between the umbilicus and the anterior superior iliac spine) will answer admirably in certain cases. After partial dilatation of the os has occurred, manual friction of the fundus may be of benefit. The performance of uterine compression (*expressio fœtus*) is highly recommended by Kristeller and Playfair. The patient resting in the lithotomy or ordinary obstetric position at the side of the bed, the uterus is grasped between the palms, and during the continuance of a pain pressure is made downward and backward: in this way the intensity of the pain is considerably increased and the labor thereby materially shortened. The objection to this method is the amount of suffering imposed upon the patient by the process. Finally, in some cases, other methods failing, it may become necessary to induce active labor-pains in the usual manner —namely, by the introduction of the hard-rubber bougie. A question of considerable interest that arises at this point is as to the advisability of the employment of ergot in these cases of true uterine inertia. Obstetricians of equal merit contend for and against the use of the drug, and it becomes obligatory upon the accoucheur in any given case to decide for himself as to whether or not any permanent advantage may follow its use. It is true that it may be, and has been, administered repeatedly without any subsequent ill effects, but when the possible accidents of considerable gravity to both mother and child that may attend the administration of the drug be taken into consideration, as well as the other less dangerous methods of terminating the labor, the medical attendant may well hesitate before resorting to a measure so

fraught with imminent peril to both of his patients. Briefly stated, these dangers are, to the mother, the possibility of the production of irregular uterine contractions, whereby the discharge of the fetus or its appendages may be prevented and uterine rupture become imminent; and, to the fetus, asphyxiation from interference with the placental circulation. Much safer would it be in these cases to give the patient small hypodermic injections of strychnin sulphate, as $\frac{1}{60}$ grain every fifteen minutes until three doses have been taken. Ustilago maidis may be used in dram doses with comparative safety: this drug very promptly stimulates the uterine muscle to contract in a normal rhythmic manner quite distinct from the tetanic action induced by ergot. 3. After the second stage of labor has begun *primary* uterine inertia always demands prompt termination of the labor by version if the presenting part have not entered the pelvic canal, or by the application of the forceps if engagement have taken place. The artificial efforts at delivery must be made with the uterine pains if the patient be unconscious, or, if she be anesthetized, at corresponding intervals. Such a procedure largely prevents extreme maternal exhaustion and postpartum hemorrhage. *Secondary* uterine inertia, or uterine exhaustion, on the other hand, is best managed by favoring sleep and by administering nerve-sedatives—chloral, the bromids, or small doses of opium. As soon as the physical strength shall have been recuperated labor will again begin and advance to a normal termination. Artificial delivery under these circumstances is always contraindicated.

The Obstetric Forceps.—The obstetric forceps is an instrument devised for grasping the fetal head in difficult labor and by traction aiding its exit. Of all instruments that have been invented throughout the domain of surgery, this is preeminently the most valuable and the most dangerous: it is capable of accomplishing infinite good or infinite harm, according as to whether it be properly or improperly employed. *Varieties.*—Since the original primitive form of

the instrument, as used by the famous Chamberlen brothers, a vast number of modifications have been offered to the profession. These may be grouped under two varieties—namely, the *simple*, including the *short* and the *long*, and the *axis-traction forceps*.

A *short forceps* is one in which the blades of the instrument are attached directly to the handles without the intervention of a shank: it possesses the *cranial* or *cephalic curve* only—that is, the outward bulging of the blades by which its accurate adaptation to the fetal head may be accomplished; this curve should be the arc of a circle the radius of which is about 11¼ cm. (4.4291 in.). Probably the best variety of the short forceps is Sawyer's instrument (Fig. 144), which is exceedingly light and very small; it is not

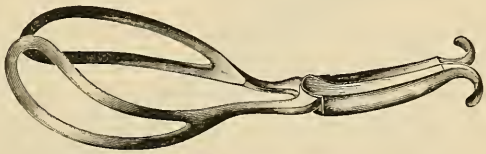

FIG. 144.—Forceps of Sawyer.

quite 10 inches in length, and weighs but 5 ounces: with it the head may be lifted from the perineum. *Indications for the Use of the Short Forceps.*—This instrument can be employed only when the head has descended to the pelvic floor; its use is therefore very limited, and the procedure is termed the *low forceps operation.* Its indications are—(1) To save the perineum when rupture seems imminent; (2) to accomplish anterior rotation when the occiput remains posterior or rotates into the hollow of the sacrum. The long forceps may be used for the same purposes.

The *long forceps* is one in which a shank is placed between the handles and the blades for the purpose of adding length to the instrument. It has, in addition to the cephalic, the *pelvic curve*, or upward turning of the blade, corresponding to the curve of the parturient canal. By means

of this curve, the concavity of which is directed upward, the instrument when applied at the superior strait rests in such a position that undue pressure is not exerted upon the perineum and soft pelvic structures. Like the cephalic, this curve should be the arc of a circle having a radius of about 11¼ cm. (4.4291 in.). *Varieties.*—The most important varieties of long forceps are the Simpson, the Hodge, the Wallace, and the Tarnier. The Simpson (Fig. 145), which

Fig. 145.—Forceps of Simpson.

is an English forceps, is steadily gaining in favor, and may be said to have become the most popular obstetric forceps in use. It is about 14 inches in length; the blades are narrow, but are separated by an interval of 3 inches at their widest point, thus preventing extreme compression of the fetal skull; the handles are serrated at their outer edges to afford a firm grasp, and are provided, just below the lock, with two shoulders, over which the fingers may be hooked during traction; the blades are united by the so-called *English lock*, which consists of a groove at the shoulder of either blade into which the shank of the opposite blade

Fig. 146.—Forceps of Hodge.

sinks. The lock is easily adjusted, and the blades are readily separated as required. The Hodge (Fig. 146) and Wallace forceps are long, slender instruments, with narrow

blades closely approximated, so that the compressing power of the instrument is much greater than that of the preceding.

By an *axis-traction forceps* is meant a variety of long obstetric forceps in which, by an appliance or supplementary handle attached to the under surface of the blades, the traction-force is exerted in the line of the axis of the parturient canal, and therefore rendered more effective, while at the same time it is reduced to a minimum. Traction is effected entirely by the supplementary, and not by the primary handles. The Tarnier axis-traction forceps (Fig. 147) is probably the best of the kind, although any

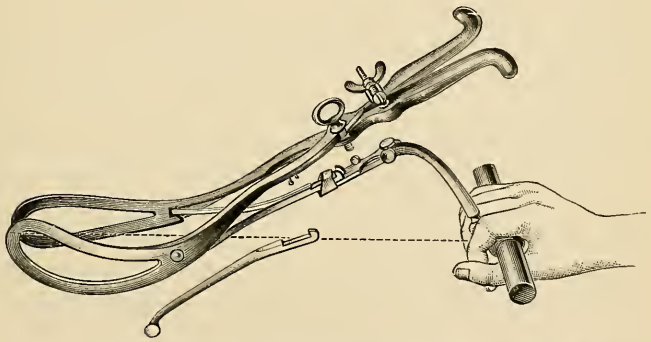

FIG. 147.—Axis-traction forceps of Tarnier (to show the details the hand is represented in an improper position for traction; below is one of the traction-rods).

long forceps—as, for instance, the Simpson variety—may be converted into an axis-traction forceps by means of a loop of tape passed through the fenestra made for the purpose in the blades of the instrument. This appliance is named, after its inventor, the *Poullet tape-attachment*, and may be employed when the true axis-traction forceps cannot be had. The special *advantages* of this instrument are twofold—namely, the traction is exerted in the axis of the parturient canal, and therefore is reduced to the minimum, and the normal movements—flexion and rotation—are not interfered with, since the forceps move with the head. The

disadvantages are the increased danger of sepsis from the complexity of the instrument and the continued pressure exerted upon the head: the forceps held by the fixation-screw cannot readily be relaxed, as can the ordinary long instrument.

Indications for the Use of the Long Forceps.—The general indication for the use of this instrument is impaction of the head during the second stage of labor for a period of two hours, the delay resulting from any of the following causes, which are stated in about the order of their frequency: (1) *Insufficient expulsive power*, as in uterine inertia (very common), abdominal inertia, or general muscular debility, such as accompanies certain acute or chronic diseases, as typhoid fever or pulmonary tuberculosis. (2) *Increased resistance in the parturient canal*, as minor degrees of pelvic contraction when the expulsive power is unable to overcome the additional resistance offered (as a rule, the forceps should not be used when the conjugate diameter of the superior strait measures less than 9 cm., or 3.5433 in.); abnormal rigidity of the cervix and other soft tissues; prolapse of the vaginal walls; edema of the structures. (3) *Over-size of the fetal head*, as in prolongation of pregnancy. (4) *Threatened maternal life when more hasty delivery is not indicated:* among these indications may be mentioned—(*a*) *Certain grave maternal diseases*, as croupous pneumonia, valvular (mitral) disease of the heart, puerperal eclampsia; (*b*) *certain maternal accidents*, as hemorrhage from marginal placenta prævia or premature detachment of the placenta, sudden syncope, rupture of the uterus after engagement of the fetal head. (5) *Threatened fetal life*, the rate and intensity of the fetal heart-beats being taken as the index by which the fetal danger may be recognized: if the heart-beats sink from the normal to 100 or less per minute, and this low rate persist, or if there be an undue rapidity, the pulse-rate rising above 160, the forceps must be applied at once. Among the indications under

this heading may be mentioned funic prolapse, premature placental detachment, and sudden maternal death during the second stage of a labor with a cephalic presentation. (6) *Certain abnormal positions and presentations of the fetus*, as persistent occipitoposterior and mentoposterior positions; in the latter case the forceps are used as rotators merely.

Contraindications to the Use of the Forceps.—The contraindications may be maternal and fetal: the *maternal* contraindications are—(1) *Any mechanical obstruction to the passage of the child through the parturient canal*, including fibroma, sarcoma, myoma, or osteoma of the uterus, ovaries, or pelvis; carcinoma of the cervix; extreme degrees of pelvic contraction. (2) *Non-dilatation* or *incomplete dilatation of the os*—that is, under three-quarters dilatation—or an *undilatable condition of the cervix*. When the os has dilated to at least three-fourths of its full extent it is perfectly justifiable under certain circumstances to introduce the blades of the forceps; under the traction, aided by the relaxation consequent upon anesthetization, dilatation will probably be completed. The dangers of such a procedure are cervical laceration to varying degrees, and premature detachment of the placenta from traction upon the non-retracted membranes that may accidentally be included within the grasp of the forceps. (3) A distended condition of the bladder and rectum. The *fetal* contraindications are—(1) *Non-rupture and non-retraction of the membranes:* these must always be ruptured before the blades can be introduced. (2) *Non-engagement of the presenting part.* There is one well-recognized exception to this contraindication—namely, in marginal placenta prævia, the object being the employment of the head as a tampon to arrest the hemorrhage; it is preferable, however, in such cases to at once perform a complete or an incomplete podalic version, thereby controlling the hemorrhage with pressure by the breech; also in certain minor degrees of pelvic contraction the head may be made to engage by applying the forceps and exerting

moderate traction. (3) *Over-size or under-size of the fetal head.* In hydrocephalus the extreme distention of the fetal skull would render the grasp of the forceps insecure, and slipping an almost inevitable accident; an under-sized head would rotate within the blades of the forceps, and the mother be subjected to imminent risk. This would also be true of a head that had been reduced by perforation of the skull with evacuation of the brain-substance. (4) *Maceration or decomposition of the fetus.* A fetus undergoing this process would be readily mutilated or decapitated by the traction that is necessary in a forceps operation, and the woman would probably be seriously injured by the sudden escape of the instrument. (5) *Assured death of the fetus or the impossibility of delivering a living fetus with the aid of the forceps.* (6) Finally, *the instrument must not be employed for the purpose of traction when the fetus occupies such a position or presents in such a manner that delivery is impossible;* thus, persistent mentoposterior positions and brow presentations contraindicate the use of the forceps.

High Forceps Operation.—When the long forceps is applied to the head, situated at or above the pelvic inlet, the procedure is termed the *high forceps operation;* when applied to the head while in the pelvic canal—that is, between the superior and inferior straits—it is termed a *median forceps operation.* A high operation is always a serious and difficult undertaking, and unless actual engagement have occurred or some other contraindication exist, version is the preferable procedure. The *disadvantages* of such an operation are manifest. In the first place, owing to the transverse position of the head and its mobility, there is secured a vicious grip upon it; the blades will lie over the occipital and frontal bones, and the dangers of fatal compression of the skull or of slipping of the instrument become imminent. The cervix also has failed very generally to become well dilated, and difficulty may be encountered in the introduction, and serious laceration

produced in this manner. Again, the compression of the head in its anteroposterior diameter causes a corresponding increase in its transverse diameter, whereby the proper moulding of the head is prevented. Finally, traction, to be exerted in the axis of the parturient canal, must be made at first *backward and downward*—a difficult procedure save with the assistance of the axis-traction forceps. It is patent, therefore, that both the fetal and maternal dangers are materially increased when it becomes necessary to resort to the use of the forceps before or immediately after engagement of the head has taken place.

The Uses of the Forceps.—The primary use of the forceps is traction, which is exerted in the axis of the parturient canal. This must always be made with the pains, or, in their absence, as in complete anesthetization, at corresponding intervals. In order to avoid slipping of the instrument during this performance a safe rule to adopt is to keep the index finger of the right hand—which is grasping the left hand in the manner hereafter to be described—well extended and just in contact with the fetal scalp; should slipping occur, the finger, leaving the scalp, will indicate the danger and the instrument can be reapplied. In making traction the extent of the force applied should be limited to that which is produced by exercise of all the muscles of the upper extremities from the shoulders down: the muscles of the body or of the lower extremities should never be brought to bear upon the instrument. The forceps may be used to secure anterior *rotation* of the presenting part when this does not occur spontaneously; it may be employed as a *lever*, the handles being swayed from side to side in order to loosen and favor the descent of an impacted head; this is known as the "*pendulum movement*" of the forceps, the latter being securely locked and a firm grasp on the fetal head maintained in order to avoid slipping. A certain amount of leverage is employed in almost every forceps delivery, but the utmost care is required to prevent perforation of the maternal struc-

tures. Finally, the forceps may, in certain selected cases and to a limited extent, be used for the purpose of *compression* in order to diminish slightly the size of the fetal head. During the process of traction more or less compression of the fetal skull is necessitated; hence arises the need of alternately relaxing and relocking the instrument in order to simulate as closely as possible the action of the uterine contractions and thereby prevent fatal compression of the fetal brain-centers. It must be remembered that compression of the handles of the instrument is not necessary to maintain the blades in close apposition to the fetal head: this is accomplished by the pressure exerted upon the blades by the structures, hard and soft, of the parturient canal, and any undue efforts at compression only result in compensatory elongation of another diameter of the fetal skull, with increased resistance in this diameter. If proper time be allowed and traction be made slowly, the head will gradually be moulded by the pressure of the walls of the parturient canal, and its delivery will be effected without damage to mother or child. In order to avoid excessive compression of the head a towel may be folded and placed between the handles.

Dangers of the Forceps Operation.—There is always more or less danger attached to an instrumental delivery, not only to the mother, but also to the child. The *fetal dangers* are—(1) Fatal compression of the vital centers, with death from asphyxiation; (2) cerebral injury from compression, resulting in temporary or permanent mental defect; (3) cerebral hemorrhage, with corresponding paralysis: this is much rarer than the following: (4) meningeal hemorrhage, resulting in temporary paralysis of certain parts: these hemorrhages are more common at the base than on the periphery of the brain; they are produced by the driving inward of edges or corners of the ununited bones, as the the parietals; (5) fractures and distortions of the cranial bones; (6) laceration of the scalp and features: an ear may

be partially or completely torn away or an eye gouged out; (7) temporary paralysis of the facial nerve from pressure upon it at its point of exit from the skull. The *maternal dangers* are—(1) Laceration of the vagina and perineum; (2) laceration of the cervix uteri; (3) severe contusions of the soft structures of the lower parturient canal; (4) loosening and separation, or even fracture, of the pelvic joints; (5) sepsis; (6) shock; (7) vaginal and vulvar thrombosis from subcutaneous rupture of a varicose vein, with secondary septic cellulitis and peritonitis.

The Application of the Forceps.—This most common of obstetric operations is probably the most often abused by the general physician. A thorough comprehension of the various steps of the operation and the reasons therefor is essential to a proper application of the blades. This includes a consideration of certain preliminary measures and the steps in the application itself. (1) *Preliminary Measures.*—(*a*) *Assistance.*—When the use of the forceps has been decided upon, certain preparations become necessary in order to ensure a successful termination of the case. In the first place, assistance is desirable, if not absolutely essential, and trained assistants, either a physician or a nurse, or both, will add considerably to the ease and ultimate success of the operation. The patient herself and her family should be advised of what is contemplated, and their full sanction secured before anything further be attempted. (*b*) *Anesthesia.*—If it be a low operation, anesthesia is not necessary; the application of the forceps in such cases is a simple matter, and does not in any way add to the suffering of the patient. In high forceps operations, requiring traction for at least an hour or two, anesthesia becomes necessary: not only does it alleviate the sufferings of the patient, but it induces relaxation of the soft structures of the parturient canal and thereby renders the operation less difficult; there is also much less danger of the patient injuring herself against the edges of the blades by some sudden movement. The *disadvantages*

of anesthesia include relaxation of the uterine tissues as well as of the other soft structures, whereby the tendency to postpartum hemorrhage is materially increased. The vomiting induced by the anesthetic, if ether be used, may become troublesome during the first few hours of the puerperium, and the disturbance of the general system of the patient may result in the retardation of the appearance of the milk, it may be for a period of twenty-four hours or more. (*c*) *Preparation of the Patient.*—The bladder must be catheterized and the bowels emptied by a simple enema. The vagina and external genitals should be rendered thoroughly aseptic by green soap and water, and then by a douche of creolin (1 or 2 per cent.) or mercuric-chlorid solution (1 : 2000). The exact position and presentation of the fetus must be determined, and the rate and intensity of the fetal heart-sounds ascertained. The *position* occupied by the patient varies: usually she is placed upon her back in the lithotomy position, but some accoucheurs prefer the English, left lateral, or obstetric position. However placed, the hips must extend well over the edge of the bed, and should the dorsal decubitus be chosen, the assistants, one on either side, must support the knees, the feet resting upon two chairs. (*d*) *Preparation of the Instruments.*—The blades, rendered absolutely clean by scrubbing with soap and hot water, are allowed to lie in a pitcher or basin of hot water or in a warm 5 per cent. solution of carbolic acid until they are required. As each is introduced into the pelvis it should be thoroughly anointed with carbolized vaselin.

Application of the Blades.—Everything being in readiness, the instrument may be applied. This may be done in one of two ways. In the first place, the blades may be introduced to either side of the pelvis and locked, irrespective of the grip taken upon the head; this is termed the *pelvic application of the forceps.* Preferably they should be so applied that they will grasp the fetal head in its transverse diameters, and, in order to accomplish this, rotation

of one or the other blade, according to the position occupied by the head, must be performed. This, the method now to be described, is known as the *cephalic application of the forceps*. When the forceps is applied in this manner it occupies the opposite oblique pelvic diameter to that in which the head is engaged, the fetal ears being opposed to the fenestra of the blades. Owing to the peculiar arrangement of the lock in the instruments generally employed, the left blade—that applied to the left side of the pelvis, and which is grasped by the left hand of the operator—is first introduced. The index and middle fingers of the right hand are passed into the vagina and up to and within the dilated cervix; these serve as a guide whereby the blade may be passed through the cervical canal and not introduced externally to that structure. The blade, grasped lightly at the handle by the thumb and one or two fingers, is applied to the vulvar orifice in such a manner that its tip corresponds to the vulvar cleft, while the handle is inclined toward the patient's head. The blade glides over the palmar surface of the vaginal hand in the direction of the sacrum: as it reaches the orifice of the cervix the handle is gently depressed and at the same time carried away from the median line, the blade making a corresponding movement toward the left side of the maternal pelvis within the uterine cavity. This maneuver must be performed with the utmost care to avoid injury to either mother or child, and in no case should force be exerted to accomplish the introduction of the instrument: if properly applied, it will glide into position almost without effort, and may then be held *in situ* by an assistant while the opposite blade is introduced. This, the right, is manipulated in the same manner, being seized, however, by the right hand and made to assume a position to the right side of the maternal pelvis. The blades as now applied do not lie in the same plane: in order to permit of locking, one or other must be rotated anteriorly, so that the biparietal diameter of the fetal head may come within

the grasp of the instrument. There has been suggested, as follows, a ready rule of practice by which it may be known which blade must be rotated in order to secure a proper grasp upon the head: Should the fetal head occupy the right oblique pelvic diameter, as in the first (L. O. A.) and third (R. O. P.) positions of the vertex, the right blade—that corresponding in name to the pelvic diameter involved—must be rotated forward; on the other hand, should the fetal head lie in the left oblique diameter of the pelvis, as in the second (R. O. A.) and fourth (L. O. P.) positions of the vertex, the left blade must be rotated forward. This rotation is accomplished not through the agency of the handles, but by the fingers of the vaginal hand — the left in rotation of the right blade, and the right when the position of the left blade must be altered. The biparietal diameter now being grasped, the instrument is readily locked and traction may be made (Fig. 148).

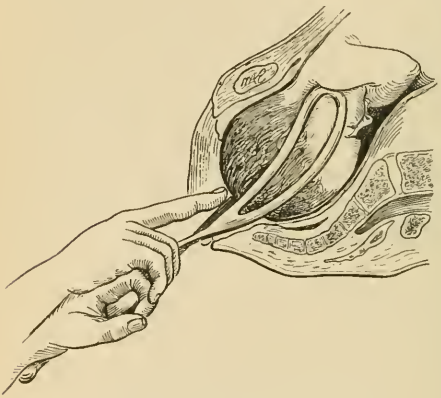

FIG. 148.—Forceps applied to the head.

Method of Delivery by the Forceps in the First Position (L. O. A.) of the Vertex.—The instrument having been applied as just described, the handles are locked and grasped by the fingers of the left hand, the middle finger of which is passed between the blades, while the index finger hooks over one shoulder of the instrument and the remaining fingers over the other shoulder; the right hand is then placed directly over the left, with the index finger extending in the interval between the blades and resting

lightly upon the fetal scalp. By the left hand steady traction is exerted outward while strong downward pressure is made with the right: the head moves in the direction of the resultant of these two forces—that is, in the axis of the parturient canal. In order to secure the slight backward movement necessary at the beginning of the high forceps operation, upward pressure may be exerted upon the handles by the fingers of the left hand at the same time that the outward traction is being made. When the occiput has descended to a sufficient extent to have become fixed under the symphysis pubis while the perineum is well distended by the advancing head, the grip upon the forceps must be altered. The operator now moves to the left side of the patient, grasps the instrument with the right hand in such a manner that the thumb rests upon the top of the handles (dagger-fashion), and with the left hand spans the posterior commissure of the vulva in order to protect the perineum. Traction is now made directly upward until the fetal head emerge beneath the retracting perineum. If this maneuver be carried out as described, Goodell's suggestion that the blades be removed as soon as the vulvar orifice dilates, in order to avoid rupture of the perineum, need not be adopted. Grave laceration of the perineum should not attend a forceps delivery with the blades *in situ* upon the head if the foregoing precepts be followed. Should it seem desirable, however, to remove the forceps before delivery of the head have been accomplished, the right blade—the last one introduced—should be the first withdrawn: this may be done by a reversal of the maneuver adopted in its introduction. Two fingers of the left hand are introduced into the vagina as far as the cervix, and so placed as to protect the soft maternal structures from the anterior margin of the blade as the latter is withdrawn. The left blade is then removed in a similar manner.

Method of Delivery by the Forceps in the Third (R. O. P.) Position of the Vertex.—In the right occipitoposterior posi-

tion the application of the forceps is precisely the same as in the first position; traction, likewise, is made as before until the head reach the pelvic floor, at which time anterior rotation of the occiput occurs while the head is still within the grasp of the forceps. The instrument is thus made to hold a vicious grip upon the head: instead of occupying, as normally, the extremities of the biparietal diameter, it grasps the head over the occipital and frontal bones. It becomes necessary, therefore, to remove the blades and to reapply them, rotating forward, however, the left blade, as the head has changed its position from the right to the left oblique pelvic diameter and now occupies the second (R. O. A.) position of the vertex. Traction is then continued as before and delivery accomplished as in a normal (L. O. A.) position.

(3) **Obstructed Labor.**—An *obstructed labor* is one in which the spontaneous delivery of the fetus is prevented by the presence of some insuperable obstacle in the parturient canal. The subject is a large one, embracing many very important subdivisions. The obstruction will be encountered either before or after canalization of the cervix, according as to whether the pathologic condition exist within the upper or the lower portion of the parturient canal. The general *symptoms* of obstructed labor in the early stages are those of protracted labor, aggravated, however, by the greater intensity of the local pelvic manifestations. Instead of the weak and inefficient action of the uterine muscles, there exists over-action of that organ, which, in its vain efforts to drive the fetus past the point of obstruction, soon falls into a condition of tonic or tetanic contraction. This is the pathognomonic sign of insuperable obstruction to labor. The woman's sufferings in consequence of this excessive uterine action are intense. Her cry is exaggerated, and she soon develops symptoms of extreme exhaustion. There is an anxious cast of the countenance; steadily increasing rapidity of the pulse, which at the same time becomes weaker

and thready; the reflex symptoms become more pronounced, especially the nausea and vomiting; increasing nervous exhaustion is indicated by extreme restlessness and jactitation. All these symptoms progressively increase in severity until the late clinical manifestations of a neglected case of obstructed labor assume a typhoid character, with profound depression and exhaustion, low, muttering delirium, coma, and death.

Diagnosis of Obstructed Labor.—Strange as it may seem, in general practice the recognition of obstructed labor has never been a matter of ease: especially is it common to find this truly serious condition confounded with that other comparatively harmless state, secondary uterine inertia or uterine exhaustion, to which it does bear a passing likeness, only, however, upon careless examination. When prolongation of the second stage of labor with failure of the presenting part to advance is mentioned, the similarity between the two diametrically opposite conditions ceases. In the following table may be found some points of differentiation between the two pathologic states:

Obstructed Labor.	*Uterine Exhaustion.*
The uterine pains, at first normal in nature, soon become tonic.	The uterine pains are either very weak and far between, or entirely absent.
Abdominal palpation reveals a rigidity of the upper uterine segment, with a high position of Bandl's ring and more or less flaccidity of the lower uterine segment; there is tenderness on manipulation.	Abdominal palpation reveals a relaxed uterine wall with a normal position of Bandl's ring, and no tenderness on manipulation.
The fetal outline and extremities cannot be palpated. There is fetal immobility.	The fetus and its parts may be readily mapped out and moved about in the uterine cavity.
Vaginal examination will usually reveal the cause of the obstruction.	Vaginal examination reveals absence of obstruction; the fetal presentation may even have reached the vulvar orifice.
The vaginal finger is unable to move the presenting portion.	The presenting portion may be displaced to a certain degree by the vaginal finger.
If engagement of the part have occurred, there may be some vulvar and vaginal edema.	The edema of the soft parts is not greater than in a normal labor.
The presenting portion in neglected cases is more or less disguised by an immense edema; in the case of the head the caput succedaneum may even resemble a bag of waters.	There is no more than the usual disfigurement of the fetal presentation.
The general condition of the patient is grave.	The patient's general condition is good.

The Dangers of Obstructed Labor.—The dangers of this condition are both fetal and maternal. The *fetal dangers* are asphyxiation from prolonged compression of the vital centers and from interference with the placental function; injury from prolonged pressure upon the limbs; the development of an inspiration-pneumonia; injury from contact with the obstruction, especially if the latter be more or less acuminate, as a spiny exostosis, a vesical calculus, or a prominent sacral promontory; and, finally, injuries from the manipulation necessary for the extraction of the fetus from the parturient canal. The *maternal dangers* are exhaustion and death; pressure-necrosis of portions of the parturient canal; uterine rupture from tetanic contraction of the upper, and excessive dilatation of the lower uterine segment; and, finally, sepsis from the necessary manipulations. *Etiology.*—The causes of obstructed labor may be fetal or maternal. The *fetal causes*—namely, malposition, malpresentation, deformities, and over-size of the fetus—have already been considered under the subject of fetal dystocia. The *maternal cause* is some excess in the resistant forces of labor: this will include a multitude of conditions, as follows: (*a*) Contractions and deformities of the pelvis; (*b*) Malformations of the uterus; (*c*) Uterine displacements; (*d*) Tumors, uterine, cervical, pelvic, and vaginal; (*e*) Rigidity or atresia of the soft structures of the parturient canal.

(*a*) *Pelvic Contraction.*—Obstruction to labor the result of pelvic malformation is, probably, next to uterine inertia, the most common variety of dystocia. The relationship existing between the respective sizes of the fetal head and the maternal pelvis, necessitating even under the most favorable circumstances a varying amount of moulding of the fetal structures in order to permit of their transmission, is so close that it requires but a very moderate degree of deviation from the normal to cause a considerable amount of difficulty in the accomplishment of parturition. This dystocia varies in its intensity from a mere retardation of the

fetus in its passage through the bony portion of the parturient canal, the result of increased friction between the fetus and the canal, to an absolute and insuperable obstruction to the progress of labor. So irregular is the shape of the human pelvis, and so complex are the forces by which this normal irregularity of shape is evolved, that the wonder is not that there should be a certain fair proportion of abnormally-shaped pelves encountered in an ordinary obstetric practice, but that this proportion of deformed pelves is not larger than it actually is. It is estimated that from 5 to 15 per cent. of all women confined present varying degrees of pelvic contraction. *Development of Pelvic Deformities.*—Pelvic deformity may be produced by three distinct processes: In the first place, it may be the result of distortion of the bony structures by various pathologic conditions, as rachitis, osteomalacia, kyphosis, scoliosis, spondylolisthesis, spondylolizema, coxalgia, and the development of neoplasmata; secondly, it may result from traumatism, as fractures and dislocations, the deformity in the latter case being the remote effect of the accident; finally, the malformation may be a direct outcome of some disturbance of the equilibrium that normally exists between the forces that contribute to the production of the peculiar complicated shape of the adult pelvis. These forces are the normal growth of the individual pelvic bones, the traction exerted on the developing bones by their ligamentous and muscular attachments, the pressure from the superimposed trunk, and the counterpressure exerted through the femora below. Let any one of these forces be deficient or in excess, and the pelvic bones fail to that extent to assume their normal shape, direction, and development. Thus, let it be supposed that the pelvic bones, which during a portion of intrauterine life are united not by firm bony structures, but by cartilaginous bands, should for any reason fail to undergo the normal process of development: there would necessarily result an abnormality in the shape of the pelvis

that would constitute a form of the so-called congenitally-contracted pelvis; such is the Naegele or Roberts pelvis. The action of the superimposed body-weight only comes into play after the child begins to assume the erect position; its tendency is to depress the sacrum and to press outward the pelvic brim (the iliac crests). The counterpressure from below through the femora is exerted in a direction upward and outward. These two forces, becoming active, are opposed by the action of the ligamentous and cartilaginous unions and the traction exerted upon the bones by the muscular attachments. As a consequence of this third, or modifying, force, the soft and developing bones of the pelvis undergo a curious process of curving and twisting that ultimately results in the characteristic formation of the pelvis of the adult. The sacrum is pushed downward, but since this force is opposed by its union with the innominate bones and by the counterforce from below transmitted from the femora, the sacrum is altered in shape from the straight fetal to the curved bone of the adult pelvis with the concavity directed inward. Let the downward pressure be excessive, and the increased bowing of the sacrum throws the promontory too far forward, with a consequent diminution in the conjugate diameter of the pelvis. The sacrum being fixed posteriorly and the symphysis anteriorly, the outward pressure upon the iliac crests results in the production of the normal curve of these portions. Let the symphysis be relaxed or congenitally split, and the iliac bones will be rotated outward and backward. In case the bones are softened by disease, the body-weight with the counterforce below displaces inward the soft structures, and greatly distorts the pelvic outline.

Varieties of Pelvic Deformity.—Clinically, pelvic deformities may be grouped into four distinct classes, as follows: 1. *Anteroposteriorly-contracted pelves*, or those contracted in the conjugate diameter only. Here may be included the simple flat and the spondylolisthetic pelves. 2.

Obliquely-contracted pelves, or those in which the pelvic outline is irregularly distorted, with greater narrowing in one half of the structure than in the opposite half, and with an increased inclination of the pelvis. Here may be included the rachitic, the coxalgic, the scoliotic (rachitic and non-rachitic), the osteomalacic, and Naegele's (or the obliquely ovate) pelves, and the distortion of the pelvis due to traumatism, such as fractures and luxations. 3. *Transversely-contracted pelves*, or those in which the main contraction lies in the transverse diameter of the pelvis. This group includes Roberts', the kyphotic, and the kyphoscoliotic pelves. 4. *Generally-contracted pelves*, or those in which there is more or less diminution in all the pelvic diameters. Here may be mentioned the justominor or small round and the generally-contracted and flat pelves.

Description of the Varieties. — 1. *Anteroposteriorly-contracted pelves.*—(1) *The Simple Flat Pelvis.*—An exceedingly common form of pelvic deformity. It consists in a simple diminution in the anteroposterior or conjugate diameter of the superior strait of the pelvis, without any disturbance in the size of the other pelvic diameters. The flattening in this variety is never excessive, and nothing is known as to its etiology. It is as common among the higher classes as among the lower, and among the generally well-developed as among those who are under-developed. The true conjugate diameter of the inlet may measure but 9½ cm. (3.7401 in.), the internal conjugate diagonal 11 cm. (4.3307 in.), and the external conjugate 18 or 19 cm. (7.0866 or 7.4803 in.). There is a slight forward displacement of the sacrum, but the pelvic outline is quite symmetric, and there will be neither accompanying spinal curvature nor signs of rachitis. There is a moderate disturbance in the relationship between the interspinous and intercristal diameters, due to a slight turning forward of the iliac fossæ. The *characteristic clinical features* are—(1) Flattening of the pelvis in the conjugate

diameter; (2) slight anterior displacement of the sacrum; (3) but slight, if any, disturbance in the relationship between the iliac crests and spines; (4) perfect symmetry of the pelvis; (5) some difficulty in reaching the lateral pelvic walls on vaginal examination. This variety of pelvic deformity does not result in serious interference with labor, although an instrumental delivery may be required should there exist a tendency to uterine inertia or a slight over-size of the fetal head. The first stage of labor is generally protracted: after engagement has once occurred the difficulty is overcome. As a rule, the head enters the pelvis transversely and extended to a slight degree, so that the bregma may be palpated. There is exaggerated lateral (*Naegele's*) obliquity, the sagittal suture approaching the sacral promontory. This is termed the *anterior parietal position*, and is a favorable conservative process of nature. Should the reverse occur, as it rarely does, the sagittal suture approaches the symphysis pubis, and the so-called *posterior parietal position* is produced: this is usually noted in primiparæ, and, if pronounced, results in an insuperable obstacle to the progress of labor, necessitating version or symphysiotomy.

(2) *The Spondylolisthetic Pelvis* (*Kilian's Pelvis; Rokitansky's Pelvis; the Prague Pelvis*).—By *spondylolisthesis*, in obstetrics, is understood a forward dislocation of the last lumbar vertebra, the body of which slides inward and downward and rests upon the upper and anterior portion of the sacral promontory (Fig. 149): there results a marked diminution in the anteroposterior diameter of the pelvic inlet, rendering labor in such a pelvis an absolute impossibility. There is, in fact, a backward dislocation of the sacrum, so that the true conjugate actually measures above the normal, but the bulk of the displaced vertebra so encroaches upon the pelvic inlet as to prevent engagement of the fetal presentation. Spondylolisthesis is more commonly encountered in obese subjects (Harris). The *causes* of the deformity are—(1) Incomplete ossification of

the last lumbar vertebra, resulting in separation of the anterior from the posterior portion under the pressure exerted by the superimposed structures (*spondylysis articularis*); (2) sudden or violent exertion or strain acting upon the preceding deformity. The displaced bone is compressed behind by the weight from above, so that it assumes a characteristic wedge-shape; further dislocation is prevented by an ossification of the intervertebral substance between it and the sacrum. Such patients generally present the history of a long siege of sickness during the development of the deformity. The *characteristic clinical features* are—(1) Diminution in the stature of the patient, with approximation of the ribs to the pelvic brim: in marked cases the ribs and iliac crests are in actual contact; (2) an extreme degree of lordosis; (3) separation of the posterior superior iliac spines; (4) diminution in the pelvic inclination, as a result of which the iliofemoral ligaments are thrown upon the stretch. These, by exerting undue traction upon their respective innominate bones, draw the latter inwardly below, so that there is an approximation of the ischial tuberosities, while the iliac crests are flared out; consequently, there is in this pelvis a diminution in the transverse diameter of the pelvic outlet with an increase in the transverse diameter of the pelvic inlet; (5) vaginal examination reveals extreme shortening in the conjugate diameter of the inlet, due to a bony prominence posteriorly, in front of which may be de-

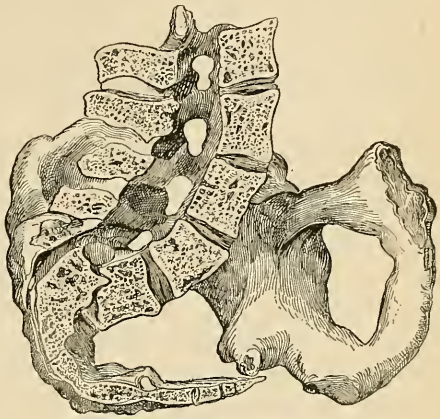

FIG. 149.—Spondylolisthetic pelvis.

tected the abdominal aorta with its bifurcation into the two common iliac arteries; also frequently the lower edges of the kidneys may be palpated.

A condition analogous to the foregoing is that known as *spondylolizema*. Here, however, the deformity is not congenital in origin, but is a direct outcome of a caries of the body of the last lumbar vertebra, which, yielding to the superimposed weight, permits a forward falling of the vertebræ above. The pelvic inlet may be so encroached upon that the displaced vertebræ are in almost actual contact with the top of the symphysis pubis, and to this condition, as well as to extreme degrees of rachitic deformity of the pelvis, has been given the name of *pelvis obtecta*.

(2) *Obliquely-contracted Pelves*.—(1) *The Rachitic Pelvis* (Pl. 4, Fig. 1).—Owing to the frequent occurrence of rickets in infants and children, the pelvic deformity resulting from this disease is very commonly encountered. Next to the simple flat, it is probably the most frequent variety of deformed pelvis met with by the obstetrician. It occurs in two well-recognized forms—namely, the flat, and the flat and generally-contracted. In the former the pelvis is closely allied in contour to the simple flat pelvis: the deformity, however, is more marked and the pelvic obliquity greater in the rachitic condition, and there are also present the characteristic epiphyseal changes. There is generally associated more or less pelvic asymmetry, one side being more roomy than its fellow: this results from the irregular action of the disease upon the osseous tissue. The mode of production of this deformity is as follows: During the process of growth the lack of lime-salts peculiar to the disease results in an abnormal softening of the bones, which, in consequence, yield more readily to the forces acting upon them. Extreme distortion of the pelvic bones may thus be produced. The pressure of the superimposed body upon the softened sacrum results in excessive bowing of the latter, with exaggerated prominence of the promontory and a

marked decrease in the vertical height. There is a backward bowing of the vertebral column, as a result of which the body-weight is directed from above downward and from behind forward; the pelvic crests are flared outward, and there results an upward and anterior inclination of the iliac fossæ, together with a marked separation of the anterior superior iliac spines, whereby the relationship existing between the intercristal and interspinous diameters is materially altered, the dimensions of the two being approximated. The obliquity or inclination of the pelvis is also increased, as in all forms of obliquely-contracted pelves: this induces greater traction upon the ligaments attached to the ischial tuberosities, and as a result these tuberosities are drawn outward and the pelvic outlet thereby increased in size. The pressure from below transmitted through the femora drives out the softened innominate bones, thereby increasing the width of the pelvis: this increase, however, is more than compensated for by the underdevelopment of the entire pelvis that characterizes the disease. The sacrum shows imperfect development of its alæ and thus contributes to the narrowing of the pelvis; as a consequence, the posterior surfaces of the iliac bones approach each other, as shown by an approximation of the posterior superior spines. In addition, all the articulations participate to a varying degree in the epiphyseal thickening. *The characteristic clinical features of the rachitic pelvis* are—(1) The presence of the peculiar epiphyseal changes; (2) extreme shallowness of the pelvic cavity, the direct result of excessive bowing of the sacrum; (3) a widening of the pubic arch from outward traction of the obturator muscles upon the readily yielding bones: this is accompanied by widening of the entire pelvis, and if it coexist with marked flattening, the so-called *figure-of-8* pelvis results; (4) distortion of the outline of the pelvic brim, which is kidney-shaped or, as has been said, occasionally resembles the figure 8; (5) disturbance of the relationship existing between the intercristal

and interspinous diameters, the two being almost or altogether equal from outward displacement of the spines; (6) under-size of the entire pelvis: the external conjugate diameter will measure 19 cm. (7.4803 in.) or under, while the internal conjugate diagonal will be reduced to 11 cm. (4.3307 in.) or less (in estimating the true conjugate, 2 cm., or 0.7874 in., must be deducted from this diameter); (7) undue prominence of the sacral promontory as determined by vaginal examination; (8) great pelvic obliquity with increase of the *conjugato-symphyseal angle* (that formed between the symphysis pubis and the true conjugate diameter of the pelvic inlet); (9) the presence of rachitic changes in other bony structures, as bowing of the legs, prominence of the shins, bossellated skull, pigeon-breast, shortness of the long bones, enlargements of the joints, and spinal curvature; (10) downward displacement of the indentation beneath the spine of the last lumbar vertebra, whereby the lozenge-shaped figure present in the normal individual (formed below by the posterior angle of the natal folds, to either side by the dimple corresponding to the posterior superior iliac spines, and above by the depression beneath the spine of the last lumbar vertebra) becomes almost, if not altogether, triangular in shape.

(2) *The coxalgic pelvis* (Pl. 4, Fig. 2) is that variety of pelvic deformity resulting from hip-joint disease. The pelvis becomes contracted obliquely from overuse of the well side and imperfect use of the affected limb. The entire body-weight is thrown upon the sound limb; consequently, the pressure from below drives backward and outward the innominate bone, while rotation of the sacrum upon its long axis occurs, the ala corresponding to the sound side being carried posteriorly: in this way there is produced a contraction of the sound side, while the forces that should normally develop the adult shape upon the opposite side are not brought into play, that portion of the pelvis retaining its rounded fetal or infantile conformation,

or, at least, the degree of alteration it had undergone at the time of the development of the coxalgia. The amount of deformity depends upon the period at which the disease has developed, the extent to which it has progressed, and the occurrence or nonoccurrence of luxation. The *characteristic clinical features* are—(1) Marked asymmetry of the pelvis; (2) more or less rotation of the pelvis upon the spinal column; (3) the presence of an ankylosed hip and other signs of the primary disease; (4) marked shortening of the conjugate diameter of the pelvis.

(3) *The scoliotic pelvis* (Pl. 4, Fig. 3) is that form of pelvic deformity resulting from scoliosis, or lateral curvature of the spinal column. It may be either rachitic or non-rachitic in origin, and varies in pathologic importance according as to whether it has developed before or after complete ossification of the pelvic bones: the rachitic variety is that most frequently encountered. In this deformity the body-weight is thrown upon that side of the pelvis toward which the convexity of the lumbar portion of the spinal column is directed. The counterforce from below must necessarily be greater and more effective upon the same side, which is, therefore, compressed from above and from below; the sacrum is carried obliquely forward and outward toward the acetabulum, and the latter is displaced upward, backward, and inward; the iliac crest of the affected side is acutely bent upon itself, and the sacrocotyloid diameter (that extending from the promontory of the sacrum to either acetabulum) of the same side is considerably shortened. The pressure from the femur on the opposite side is directed upward and outward, thereby displacing outwardly the innominate bone and dragging the symphysis pubis to that side. The *characteristic clinical features* are—(1) Marked asymmetry of the pelvis, coexistant with an appreciable degree of scoliosis; (2) marked shortening of the internal conjugate diameter, associated with an inequality between the two sacrocotyloid diameters.

(4) *The osteomalacic, malacostean, or* Y*-shaped pelvis* (Pl. 4, Fig. 4) is a variety of pelvic deformity rarely seen in the United States, but of rather common occurrence in various portions of Southern Europe: it is due to the affection known as osteomalacia, in which the pelvic bones undergo a remarkable degree of softening from absorption and removal of their lime-salts. This pathologic process is carried to such an extreme degree that the upward pressure transmitted through the femora drives inward the innominate bones, often asymmetrically, while the attachment of the muscles to the pubis holds it in place; as a result there occurs a characteristic protrusion of the symphysis pubis resembling the beak or rostrum of a ship; hence its name, the "*beak-shaped*" or *rostrate pelvis.* The body of the sacrum, also softened by the disease, is carried downward and forward by the superimposed body-weight, while the muscles and ligaments attached to its alæ drag the latter backward and upward; the convexity of the sacrum is, therefore, anteriorly from above downward and from side to side. There is an outward displacement of the tubera ischii, resulting in an increase in the transverse diameter of the pelvic outlet. The attachments of the sacrosciatic ligaments to the lower extremity of the pelvis draw it inward, so that there is a pronounced anterior curvature of this portion of the bone, and the coccyx almost entirely obliterates the pelvic outlet in its conjugate diameter. *The characteristic clinical features* are—(1) Marked softening and asymmetry of the pelvis; (2) a characteristic beak-like projection of the symphysis pubis, into which, on vaginal examination, the finger may be inserted; (3) a sharp anterior curvature of the tip of the sacrum and the coccyx, almost totally occluding the pelvic outlet; (4) an increase in the transverse diameter of the pelvic outlet, as shown by a separation of the ischial tuberosities; (5) extreme prominence of the sacral promontory; (6) extreme tenderness of the pelvic bony structures, with

softening to such a degree (in advanced cases only) that their shapes may be altered by manual efforts; (7) the history and symptoms of the disease—inability of the patient to stand or walk, pain on motion, paroxysms of dyspnea, cough, cramp-like pains in the muscle, from collapse of the pelvis. Women lose from six inches to a foot or more in height in this disease, which always originates during a previous pregnancy.

(5) *Naegele's* or *the obliquely ovate pelvis* (Pl. 4, Fig. 5) is an exceedingly rare variety of pelvic deformity consequent upon absence or imperfect development of one ala of the sacrum. As a result, the pressure from the femur upon the corresponding side is directed upward, so that the innominate bone is carried upward and inward: on the opposite side of the pelvis the pressure is directed upward and outward: hence there is an actual enlargement of that side, the acetabulum and the symphysis pubis being carried outward; the iliac fossa of the sound side is directed more anteriorly and externally. *The characteristic clinical features* are—(1) Marked asymmetry of the pelvic crests; (2) lateral displacement of the symphysis pubis (toward the sound side); (3) approximation to the sacral spines of the posterior superior iliac spine of the affected side; (4) an increase of the oblique diameter running from the posterior superior iliac spine of the affected side to the anterior superior iliac spine of the sound side; (5) on vaginal examination a marked diminution in the oblique diameter running from the point just over the central portion of the obturator foramen on the affected side to the opposite sacro-iliac synchondrosis, as determined by direct pelvimetry.

(6) *The Oblique Pelvis due to Traumatism* (Pl. 4, Fig. 6).—Fractures and luxations, whether congenital (intrauterine) or resulting in after-life, give rise to grave forms of contracted pelvis. Such pelves are asymmetric, at times undeveloped (when fracture has occurred early in life), and are always associated with much deformity. The contraction

lies in the fractured side of the pelvis. In *congenital luxation* of the hips the rotator muscles of the thighs are put on the stretch, and the pelvic inclination thereby increased, the sacrum occupying an almost horizonal position. The heads of the femora rest in these cases upon the iliac dorsa; the pressure from below results in an inward displacement of the iliac bone, with outward traction upon the tuberosity of the ischium, which is displaced from the median line; the pelvic inlet is lessened, while the outlet is increased in size: this is especially marked in cases of double dislocation. In unilateral dislocations the pelvis becomes obliquely contracted, the symphysis pubis being slightly drawn to the affected side. A similar contraction occurs in the *sitz pelvis*—that resulting from the removal of one limb in early life.

3. *Transversely-contracted Pelves.*—(1) *Robert's pelvis* (Pl. 5, Fig. 1) is a very rare variety of deformed pelvis, not more than eight or nine specimens having been recorded in all medical literature. It consists in a duplication of the congenital defect in Naegele's pelvis; that is, there is absence or imperfect development of both sacral alæ. As a direct consequence of this extreme narrowness of the sacrum the pelvis is much diminished in its transverse diameter. There is a slight forward displacement of the sacrum, with a corresponding diminution in the conjugate diameter of the inlet; the anterior convexity of the sacrum is marked, the curve of the iliac crests is less than normal, and the posterior superior iliac spines are not carried as far back as usual. *The characteristic clinical features* are—(1) Marked diminution in all the transverse diameters of the pelvis; (2) the space between the posterior superior iliac spines is slightly increased; (3) by vaginal examination the promontory is found to be much higher than normal; (4) there is an approximation of the ischial tuberosities; (5) there is a diminution in the pubic angle.

(2) *The kyphotic pelvis* (Pl. 5, Figs. 2, 3) is that pelvic de-

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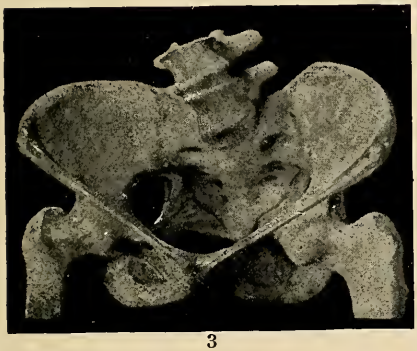

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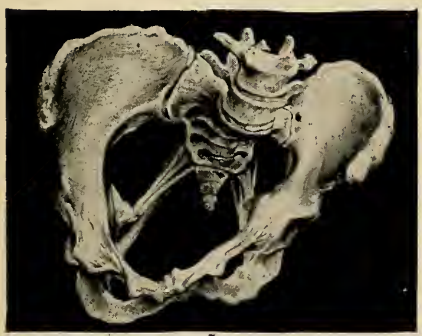

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Abnormalities of the female pelvis (*American Text-Book of Obstetrics*): 1, typical flat rachitic pelvis; 2, coxalgic pelvis; 3, scoliotic rachitic pelvis; 4, osteomalacic pelvis; 5, obliquely-contracted pelvis (Naegele); 6, fracture of the pelvis (Otto).

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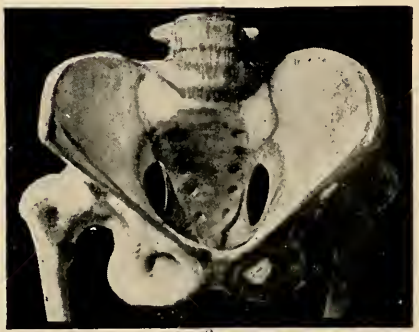

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Abnormalities of the female pelvis (*American Text-Book of Obstetrics*): 1, transversely-contracted pelvis (Robert); 2, contracted outlet of a kyphotic pelvis (Barbour); 3, kyphotic pelvis from above (Barbour); 4, asymmetrical contraction of the outlet from kyphoscoliosis; 5, justominor pelvis; 6, fetal ill-developed pelvis, probably an arrested development from rachitis.

formity resulting from kyphosis or Pott's disease of the spine when the site of the spinal lesion is so low that the compensatory lordosis cannot correct the maldirection of the force exerted by the superimposed body-weight. In consequence of the break in the axis of the spinal column the body is inclined forward; the downward pressure is thrown from before backward, and as a result of this alteration in the pressure there occurs a backward displacement of the sacrum, with a diminution in the pelvic inclination. The sacral promontory rises and the conjugate diameter of the brim is increased. The backward pressure upon the sacral promontory is resisted by the sacroiliac synchondroses, and there is produced in this way an increased anterior concavity of the bone from side to side, with a corresponding diminution in its width: the ischii are thereby approximated, and the pelvis is narrowed throughout its entire depth, the most appreciable diminution in width being manifested at the pelvic outlet from inward displacement of the ischial spines. The inferior strait is, moreover, further impinged upon by a compensatory forward displacement of the coccyx and the tip of the sacrum. From the increased outward pressure upon the iliac crests, supplemented by the extra strain thrown upon the tense iliofemoral ligaments (which drag the anterior inferior iliac spines outward and downward) there is afforded more room above at the pelvic inlet in proportion as the pelvic outlet is straitened. In pelves of this description the first stage of labor may be perfectly normal or even more precipitate than usual, but when the fetus descends through the pelvic cavity it encounters increased resistance at the outlet, and the obstruction may even prove insuperable. It has been found that occipitoposterior positions are by no means infrequent in this condition: this may be accounted for by the backward displacement of the promontory affording greater room for the dorsum of the fetus. *The characteristic clinical features* are —(1) The associated kyphosis with its characteristic fea-

tures; (2) slight increase in the dimensions of the pelvic inlet; (3) approximation of the ischial spines; (4) diminution of the conjugate diameter of the outlet; (5) by vaginal examination difficulty in palpating the sacral promontory.

(3) *The kyphoscoliotic pelvis* (Pl. 5, Fig. 4) is that deformity arising from a coexistence of kyphosis and scoliosis, the combination resulting in a minor degree of obliquely-contracted pelvis, but with the main contraction lying in the transverse measurements of the pelvis. The tendency of the kyphosis is to dilate the superior strait of the pelvis: the scoliosis tends in the diametrically opposite direction, but, as it is the secondary condition, the pelvis has largely acquired its deformity before the scoliosis begins to act upon it. It presents, therefore, some of the characteristics of both, and also retains some of its original funnel shape. The joints all present the usual alterations of rachitis: there is an increase in the conjugate diameter of the inlet, and a general transverse flattening of the pelvis, as in kyphosis; there is a slightly oblique contraction of the pelvis, the symphysis pubis being drawn to the side opposite to that toward which the lumbar convexity is directed; the sacrocotyloid diameter of the side corresponding to the lumbar convexity is shorter than that of the opposite side. *The characteristic clinical features* are—(1) Marked asymmetry; (2) lateral contraction to a degree less than that noted in the kyphotic pelvis; (3) the combined presence of rachitic and kyphotic deformities in the bones of the spinal column; (4) the vaginal signs are the same as in the kyphotic pelvis.

4. *Generally-contracted Pelves.*—(1) The *justominor, symmetrically or generally equally contracted* (*pelvis æqualibiter justominor*), *dwarf, or small round pelvis* (Pl. 5, Fig. 5) is that variety of pelvic malformation in which the entire pelvis is undersized, although preserving the normal relationship between its various diameters. This variety of pelvic

deformity is quite frequent, especially in hospital and dispensary work, and is commonly encountered among shop- and mill-girls and in those women who have been reared in poverty and under bad hygienic surroundings. It may, however, be found in women who are otherwise normally developed. There is an increased concavity of the sacrum from side to side; the promontory is displaced upward; there is an approximation of the iliac crests and spines, with a separation of the posterior superior iliac spines. More or less difficulty is encountered at the beginning of labor, and this rapidly increases as the labor progresses; the narrowing of the pelvic canal results in overflexion of the head and undue prominence of the posterior fontanel, the sagittal suture occupying an oblique diameter. Anterior rotation occurs early and is complete, but the descent fails to occur, and there is almost invariably an absence of the lateral obliquity noted in flat pelves. *The characteristic clinical features* are—(1) Slight diminution in the transverse measurements; (2) marked shortening of the conjugate diameter of the superior strait; (3) the lateral pelvic walls are in easy access, and frequently the iliopectineal line may be traced around the entire pelvis; (4) the sacral promontory is situated high up.

(2) *The masculine, fetal, lying-down, undeveloped, juvenile, infantile, or funnel-shaped pelvis* (Pl. 5, Fig. 6) is that pelvic deformity produced by a failure of action of the forces upon which the development of the peculiar shape of the pelvis depends. This is an exceedingly rare variety of misshapen pelvis: it is generally encountered in those girls or women who have been afflicted with infantile paralysis, or who, for other reasons, have never walked; slight degrees are also encountered in very young pregnant girls. There persists the characteristic shape of the fetal pelvis—namely, abnormal length and narrowness of the sacrum, marked transverse contraction of the pelvis, unusual height of the promontory, and increase in the length of the diago-

nal conjugate diameter. *The characteristic clinical features* are—(1) Extreme narrowness of the entire pelvis, with lack of the normal hip-expanse; (2) unusual straightness of the sacrum; (3) high position of the sacral promontory.

(3) The *generally-contracted and flat pelvis* is a rather common form of pelvis in which the deformity is not the result of rachitis, but is a congenital defect. There is a diminution in all the pelvic diameters, but especially in the conjugate diameter of the inlet. Labor is more seriously impeded under these circumstances than in the case of a simple flat pelvis, for the reason that compensatory room is not afforded for the fetal head in the oblique diameters. The sacral promontory is situated high above the pelvic brim, and the alæ are underdeveloped, as are also the innominate bones. *The characteristic clinical features* are —(1) An increase in the diagonal conjugate diameter, owing to the increased height of the sacral promontory; (2) a diminution in the true conjugate; (3) under-size of the entire pelvis.

Diagnosis of Contracted Pelvis.—The diagnosis of pelvic contraction is an important matter, and is generally made by reference to and discovery of the characteristic clinical features of the various forms of deformity as enumerated in the foregoing pages. The previous history of the individual case will likewise be of assistance in arriving at the probable variety of deformity present. The appearance of rachitic malformations elsewhere will lead to the strong supposition of the coexistence of pelvic deformity. The history of the previous labors is valuable, as indicative of the probable course of the existing pregnancy. In addition to these methods of diagnosis, resort to the use of the pelvimeter is essential when a pelvic contraction is suspected. The normal measurements of the pelvis have already been given (see page 31), and the main alterations in the various deformed pelves are enumerated in their proper places under the description of these deformities. Spiegelberg

suggests the following general aids to diagnosis in the case of pelvic contraction: 1. If the interspinous and intercristal diameters be less than normal but their relation unchanged, the pelvis is probably uniformly contracted. 2. If the intercristal diameter be normal but the interspinous diameter increased, there is probably a contraction of the conjugate diameter of the inlet. 3. If both the interspinous and intercristal diameters are diminished but their relation is abnormal, the interspinous equalling or exceeding the intercristal diameter, the pelvis is probably uniformly contracted, and presents also a shortening of its conjugate. As suggested by Grandin and Jarman, in pelvic contraction there is also a disturbance in the normal relationship existing between the height of the fundus uteri and the top of the symphysis pubis; there is generally an increase in the distance between the two. Thus, at the sixth month, instead of the fundus corresponding to the umbilicus, it will probably occupy the position of the fundus at the seventh month, unless there be associated a degree of pendulous abdomen, as is not uncommon, in which case it may even rest in front of the symphysis. The height at the other months of gestation will show a corresponding alteration.

Prognosis of Contracted Pelvis.—When pregnancy and labor are complicated by pelvic contraction a serious obstetric condition is to be dealt with. Not only is a grave form of dystocia to be anticipated, but even during pregnancy itself may serious complications arise. Should the uterus be retroverted, the danger of incarceration is greatly enhanced by a flattening of the pelvis; later in the course of pregnancy anterior and lateral displacements of the gravid uterus are produced by the undue prominence of the sacrum with consequent shortening of the conjugate diameter; pendulous abdomen is thus a frequent accompaniment of flattened pelvis. From inability of the fetal presentation to engage in the superior strait the usual

symptom of lightening does not occur, and the patient is frequently a victim of distressing paroxysms of dyspnea. Still more serious than the foregoing are the maternal and fetal dangers during parturition. These may be enumerated as follows: 1. *The maternal dangers* include—(1) Non-engagement of the part, with prolongation of the labor, and death from exhaustion if relief be not afforded by operative interference; (2) rupture of the uterus from tetanic contraction of the upper uterine segment, with rise of Bandl's contraction-ring and overdistention of the lower uterine segment; rupture of the vagina may also occur from overdistention of its tissues; (3) premature rupture of the bag of waters, with resultant dry labor and all its attendant evils; (4) sloughing of the cervix uteri or upper vaginal tract from prolonged pressure by the presenting part; vesicovaginal and rectovaginal fistulæ may be produced in this manner; (5) increased tendency to postpartum hemorrhage from exhaustion consequent upon excessive uterine action; (6) increased liability to sepsis from the frequent manipulations or the operative procedures necessitated by the abnormal condition of the pelvis. *The fetal dangers* are—(1) Asphyxiation, from compression of or interference with the placental circulation; (2) malpresentation and malposition, from undue mobility of the uterus; (3) funic prolapse, from imperfect approximation of the fetal presentation to the pelvic inlet; (4) deformity of the presenting part, from excessive edematous infiltration due to the extreme prolongation of the labor; (5) fatal compression of the vital centers, with death from asphyxiation; (6) the production of ecchymotic spots, or even of extensive sloughing of the soft structures of the head, from pressure exerted by the contracted pelvis; (7) excessive moulding and deformity of the head, from distortion of the birth-canal. The varieties of deformity thus produced are manifold. There may be a simple overlapping of the bones, with consequent diminution of the transverse measurements

of the fetal head and compensatory elongation of its long diameters. The dangers arising from this deformity are fatal compression of the cerebral centers and intracranial hemorrhage from laceration of the brain-sinuses. In other cases grooves or indentations of the parietal and other bones result from the excessive pressure exerted by the sacral promontory or by the forceps-blades during the process of extraction: these are not actual fractures, and generally disappear during the first few months or years of the child's existence. Still more rarely actual fractures of the cranial bones are produced, and the child may perish from fatal compression of the brain-centers or from intracranial hemorrhage; (8) fractures and dislocations of the extremities, dislocation of the neck, or even decapitation from overtraction.

The Treatment of Contracted Pelvis.— Necessarily, the treatment of labor occurring in a woman with pelvic contraction will depend upon the degree of deformity, and especially upon the amount of diminution in the conjugate diameter of the inlet. In the minor degrees of contraction the labor may be spontaneously terminated after considerable prolongation of its stages; or it may become necessary to artificially bring it to an end by the performance of some of the minor obstetric operations, as the application of the forceps or the performance of version. In the more advanced degrees of contraction embryotomy or one of the mutilating maternal operations will be indicated. Bearing in mind that there is no fixed rule for the management of these labors, and that each case must be treated according to the conditions therein found, a safe general rule to follow is that which has been adopted by most of the leading obstetricians, as follows: (1) Should the abnormal condition be discovered some time during the early months of gestation, and the contraction in the conjugate diameter amount to but 1½ cm. (0.5906 in.) or less—the true conjugate measuring between 11 cm. (4.3307 in.) and 9½ cm. (3.7401 in.)—

such a patient may, without undue hazard, be allowed to proceed to term: it is probable that both maternal and fetal life will be saved and the fetus will not be exposed to the risks of prematurity. The *dangers* of such a labor are—(*a*) Exhaustion from increased violence of the expulsive efforts and prolongation of the labor; (*b*) in multiparæ and exhausted primiparæ the woman must probably be subjected to the risks of an instrumental delivery, or, should engagement fail to occur, to the dangers of version; (*c*) in a large proportion of the cases some fetal abnormality, as malposition, malpresentation, or funic prolapse, will further complicate the labor. When such a course as the foregoing is adopted the progressive increase in the size of the fetal head in successive pregnancies must always be borne in mind. It not infrequently happens that a woman with such a pelvic contraction will spontaneously deliver herself in the first two or three pregnancies, each labor being attended with increasing difficulty, which at the succeeding parturitions becomes insuperable without manual interference. Another factor to be considered is the relative proportion of the parents' heads and shoulders as influencing the size and development of the fetus. If the uterine contractions alone are unable to effect delivery, the forceps must be applied if the fetus present in a favorable head position; in other cases, as face or brow presentation, posterior parietal position, or nonengagement of the head, or when there coexists some complication, as a compound presentation or a funic prolapse, the indication is to perform podalic version. (2) Should a greater degree of pelvic contraction exist, the true conjugate diameter of the inlet ranging between 9½ and 8 cm. (3.7401 to 3.1496 in.), it would be injudicious to allow the woman to proceed to term: such a course would necessarily result in the performance of a mutilating operation upon mother or child. When it is remembered that at the end of the ninth lunar month (two hundred and fifty-second day or thirty-sixth week) each diameter of the fetal head

is 1 or 1½ cm. (0.3937 or 0.5903 in.) less than at term, and that a child delivered at this period has an almost equal chance of survival with one born at term, it becomes patent that the induction of premature labor is eminently proper. This should be performed early in the thirty-second week if the true conjugate measure but 8 cm. (3.1496 in.), and perhaps not until the thirty-sixth week if it measure 9 or 9½ cm. (3.5433 to 3.7401 in.). It must be remembered that the size of the fetal head varies in different individuals, and that what might prove an easy labor in one woman at the thirty-sixth week with a conjugate measuring 9½ cm. (3.7401 in.) would in another woman with the same conjugate, but a larger fetal head, be almost an impossible labor. In any given case in which it is deemed advisable to induce labor prematurely at a certain period, it would be well to make a careful examination at least two weeks prior to that date, in order to ascertain the relative proportion of the fetal head to the pelvic inlet; and should any disproportion be found to exist, labor must be induced immediately. After labor has begun, should engagement fail to occur and the patient begin to suffer from exhaustion, podalic version must be performed and the child extracted: after engagement of the head, if the unaided uterine contractions fail to accomplish the delivery of the fetus, the forceps may be applied and labor terminated artificially. (3) In still greater degrees of contraction in the conjugate diameter of the inlet (from 8 to 7 cm.—3.1496 to 2.7559 in.), according to the present teaching of the most advanced obstetricians, there is found the indication for symphysiotomy: this may be performed from two to four weeks before term in the graver degrees of contraction, and even then labor will require instrumental assistance in order to be successfully terminated. Should such a case be encountered at term (that is, with the conjugate measuring from 7 to 6½ cm.—2.7559 to 2.5590 in.), it is probable that the more judicious proceeding would be the performance of a Cesarean section if the consent of the

patient and her family can be obtained. In case of fetal death craniotomy alone must be considered. The application of the forceps is absolutely contraindicated in all major pelvic contractions. (4) Finally, in all degrees of contraction under 7 cm. (2.7559 in.) there are but three methods of treatment presented: In the first place, in case a patient with such a grave pelvic contraction be seen during the early months of gestation, the extreme importance of an early termination of the pregnancy should be impressed upon her, and, with her consent, steps to that effect should be instituted. If this course be refused, or if the patient be seen only at or near term, there remain but two procedures either a Cesarean section followed by a Porro operation, or, if fetal death be assured, craniotomy.

The Treatment Indicated in the Special Forms of Pelvic Deformity.—The foregoing course of treatment for all pelvic contractions may be specialized as follows: (1) *The Simple Flat Pelvis:* (*a*) The induction of premature labor if the contraction be extreme: this should be done as early as from the thirty-second to the thirty-sixth week of gestation. (*b*) At term the application of the forceps, the performance of version or symphysiotomy, or, in case of fetal death, craniotomy. (2) *The Spondylolisthetic Pelvis:* The treatment varies according to the degree of deformity and the time at which the patient is seen. It may consist in the induction of premature labor, the application of the forceps, or the performance of version, Cesarean section, or craniotomy, the latter only in the case of fetal death. (3) *The Rachitic Pelvis:* The treatment is the same as that of the simple flat pelvis, with the addition of Cesarean section and the Porro operation in extreme contraction. (4) *The Coxalgic Pelvis:* The treatment is the same as that of the spondylolisthetic pelvis. (5) *The Scoliotic Pelvis:* (*a*) In minor degrees of contraction the treatment is that of the simple flat pelvis. (*b*) In pronounced contraction symphysiotomy, Cesarean section, or craniotomy (in case of death

of the fetus). (6) *The Osteomalacic Pelvis:* (*a*) Usually labor is not interfered with in the very slight or even in some well-marked cases of the deformity: indeed, in the latter cases it may be so precipitate that energetic efforts at retardation of the advancing head will be indicated. (*b*) In many cases forceps, symphysiotomy, or version may be required. (*c*) In rare cases the obstruction may be so absolute as to indicate Cesarean section with the performance of a Porro operation. (7) *Naegele's Pelvis:* (*a*) If diagnosed early in pregnancy, labor should be induced as early as the twenty-eighth or thirtieth week of gestation. (*b*) At term Cesarean section must be performed, or, if the child be dead, craniotomy. *Ischiopubiotomy*, or Farabeuf's operation, has been highly recommended (Morisani) in the treatment of labor at term in this pelvis, but its value is doubtful. (8) *The Oblique Pelvis of Traumatism:* (*a*) If it be seen early in pregnancy, the induction of premature labor is indicated. (*b*) At term the treatment is that of the rachitic pelvis. (9) *Robert's Pelvis:* (*a*) If seen early in pregnancy, the induction of abortion is required. (*b*) At term Cesarean section or craniotomy must be performed. (10) *The Kyphotic Pelvis:* (*a*) If the pelvic deformity be marked, labor should be induced at from the thirtieth to the thirty-fourth week. (*b*) At term, after engagement of the head, the forceps should be applied unless the contraction at the outlet be extreme, when either symphysiotomy, Cesarean section, or craniotomy (in case of death of the fetus) is indicated. (11) *The Kyphoscoliotic Pelvis:* The treatment is that of the kyphotic or of the rachitic pelvis, according to the type of deformity that is most pronounced in the individual case. (12) *The Justominor Pelvis:* The treatment varies. If seen before term, premature labor must be induced at from the thirty-fourth to the thirty-sixth week; if seen at term and engagement take place, the child may be delivered by forceps or by symphysiotomy; if the fetus be dead, craniotomy must be performed; if en-

gagement fail to occur, Cesarean section is indicated if the fetus be living, and embryotomy if it be dead. Version is never indicated in this variety of deformity. (13) *The Masculine Pelvis:* (*a*) If seen early in pregnancy, abortion should be induced. (*b*) At term the only course is Cesarean section, unless the child be dead, when craniotomy must be performed. (14) *The Generally-contracted and Flat Pelvis:* (*a*) The induction of premature labor from four to six weeks before term. (*b*) If seen at term and engagement take place, the fetus may be delivered by forceps or by symphysiotomy; if the fetus be dead, craniotomy must be performed. (*c*) If engagement fail to occur and the contraction be not excessive, version may be performed; otherwise Cesarean section is indicated if the fetus be living.

Pubic Symphysiotomy, or Sigault's Operation.—Pubic symphysiotomy is the operation of cutting through the pubic symphysis for the purpose of increasing all the diameters of the pelvic canal. *Indications.*—The main indication for this operation is a marked contraction of the pelvis, from 8 to 7 cm. (3.1496 to 2.7559 in.), when the fetus is living and delivery by version or the forceps is impossible. By this operation it is possible to materially increase all the diameters of the pelvic inlet, and thereby render possible a labor that must otherwise be terminated by Cesarean section or craniotomy. According to Hirst, the amount of increase in the pelvic dimensions is as follows: When the pubic bones have been separated by an interval of 7 cm. (2.7559 in.) there is an increase in the conjugate diameter of 1½ cm. (0.5906 in.), in the oblique diameter of 3½ cm. (1.3879 in.), and in the transverse diameter of a little over 3 cm. (1.1911 in.): with such an increase as this the fetal head can be delivered through a canal that would otherwise be impassable. In the graver degrees of pelvic contraction—that is, in pelves having a conjugate diameter under 6½ cm. (2.5590 in.)—there would not be a

sufficient increase in the pelvic diameters after the performance of symphysiotomy to permit of the delivery of a living child: such degrees of contraction, therefore, contraindicate the operation, as do also assured fetal death and ankylosis of the sacroiliac synchondroses. It is important that the cervix be dilated or thoroughly dilatable. The operation is obviously intended to supplant the radical operation of craniotomy and thereby save the fetal life. Other indications are persistent mentoposterior positions when the child is living, occasionally in occipitoposterior positions and in the presence of small pelvic tumors. *Methods of Operating.*—There are two well-recognized methods of performing symphysiotomy, known respectively as the *Italian*, or *subcutaneous*, and the *German*, or *open*, *methods*. The latter consists in making an incision directly over the symphysis pubis and continuing it down through the line of cartilaginous union. There are two well-founded objections to this plan of procedure: in the first place, the great vessels that are situated at this point are more exposed to injury during the operation; in the second place, the divided joint is exposed directly to contact with the atmosphere and is liable to be soiled with the lochia, thereby favoring the development of sepsis. By far the better method is that adopted by the Italians, the steps of which will now be described. *Instruments Required.*—The Galbiati or Morisani knife (Fig. 150) (a falcate or sickel-shaped knife especially devised for the operation) or a blunt-pointed bistoury; a simple scalpel; two or more hemostatic forceps; a chain-saw (in case osseous union be found); a needle-holder and nee-

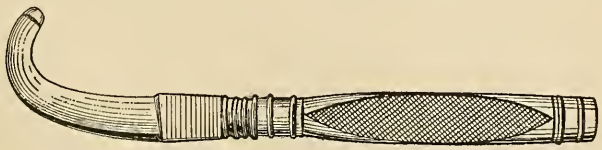

FIG. 150.—Galbiati knife.

dles; an obstetric forceps; a metallic catheter; strips of iodoform-gauze; strips of adhesive plaster; Chinese silk for ligatures; antiseptic cotton; and a strong abdominal binder. *The Steps of the Operation.*—1. The woman is placed in the lithotomy position at the edge of the bed or table. 2. Thorough asepsis of the abdominal surface, the pubes, the genitalia, and the perineum; the mons veneris must be shaved. The parts should first be scrubbed with soap and water, and then bathed in boiling water, then in benzine to remove the fat, and, finally, in a 1 : 1000 mercuric-chlorid solution. The bladder and bowels must be emptied. 3. *Exposure of the Retropubic Space* (*Space of Retzius*).—A short incision is made in the median line just above the symphysis, about 1½ to 2 inches long and extending to about ¾ of an inch above the upper edge of the symphysis pubis; this incision is carried down to the fascia that lies directly above the recti muscles. 4. The attachment of the recti muscles to the rami of the pubes is then severed to an extent sufficient to permit the introduction of the left index finger, which is passed down over the inner surface of the symphysis to its lower margin, where the line of junction is located. 5. The metallic catheter is passed into the urethra to locate that structure, which is then carried downward and to the right, where it will be least likely to be injured by the operation. 6. *Division of the Symphysis.*—The Galbiati knife is passed along the left index finger and made to hook under the symphysis, and at the same time inclined slightly toward the left to avoid the urethra; by a rocking or sawing movement the joint is severed from below upward and from within outward, the bones separating with an audible sound. Care must be taken to divide the subpubic ligament. Occasionally this process requires the exertion of a considerable amount of force: the hemorrhage that invariably follows division of the symphysis must be checked by the introduction of a wedge of iodoform-gauze. The catheter is then removed.

7. *Delivery of the Child.*—The os is now dilated, the membranes ruptured, and, if engagement have taken place, the forceps applied and the head rapidly extracted: as traction is made and the head descends there is produced a considerable gaping of the symphysis, and to prevent this from becoming too excessive an assistant should support the sides of the pelvis and the two trochanters; otherwise rupture of one or both sacroiliac synchondroses might follow. If engagement have not occurred, version may be performed. During the process of delivery the abdominal incision must be protected by a pledget of iodoform-gauze. 8. *After-treatment.*—Uterine contraction must be secured in the usual manner. The abdominal wound is then closed—after reintroduction of the catheter—with from four to five sutures, the lower of which passes, if desired, through the upper cartilaginous surface of the symphysis: wiring of the bones, as recommended by many German operators, is an unnecessary and dangerous procedure, not infrequently resulting in necrosis and fistulæ; an antiseptic dressing is applied and secured by adhesive strips. The vagina must be packed with a strip of iodoform-gauze or filled with a mixture of iodoform and boric acid, 1 part to 8. A firm abdominal binder, preferably furnished with eyelets, is adjusted and tightly laced. During convalescence a pad must be placed between the knees, and the limbs bound together to secure accurate adaptation of the severed symphyseal cartilages. Catheterization of the bladder may be required. The woman must be confined to bed for from three to five weeks. This operation is entirely extraperitoneal, and in the hands of a skilled obstetrician may be performed in five or ten minutes. *Mortality of the Operation.*—Taking into consideration all the cases reported under the present method of operating, from 5 to 10 per cent. of the patients lose their lives. A certain proportion of this number perish because the operation is not attempted until the vitality is ex-

hausted: an early interference would probably materially lessen the death-rate. Others die from septic infection, exhaustion, pneumonia, and hemorrhage (open method). The *infantile* mortality is about 20 per cent., mainly arising from injuries during the process of extraction. *Dangers of the Operation.*—(1) *Sepsis.*—The close proximity of the genitalia to the abdominal wound and the marked tendency in bone- and joint-wounds to the development of septic processes render the utmost care necessary to avoid contagion after the operation. The strict confinement of the limbs adds materially to the difficulty of thoroughly disinfecting the genitalia and removing the lochia. (2) *The Development of Vesicovaginal and Urethrovaginal Fistulæ.*—These may result from carelessness in the approximation of the pelvic bones. When the symphysis is separated there occurs a forward bulging of the peritoneum above and of the bladder below to such an extent as to almost fill the gap produced. Should these not be carefully replaced prior to the adjustment of the bones, they may readily be caught between, with the subsequent production of a fistula. Another possible mode of production is the direct nicking of the bladder by the Galbiati knife at the time of operation. However produced, should spontaneous cure under antiseptic precautions and constant catheterism of the bladder not occur, a secondary operation will be indicated after the close of the puerperal period. (3) *Subsequent Interference with Locomotion.*—For a varying period following symphysiotomy the patients will generally complain of some degree of motility of the joint, inducing a curious waddling gait, which will persist until the fibrous tissue thrown out between the bones becomes organized. In a few cases more or less permanent disability has been noted, but whether or not this is to be an item of serious import in the consideration of symphysiotomy it is too early as yet to determine. (4) *Hemorrhage*, as has already been

stated, occurs only in the open method of symphysiotomy, due to the cutting or tearing of the venous plexus surrounding the neck of the bladder, or of the erectile tissue of the urethra and clitoris. It is exceedingly difficult to control. This is best done by inserting a piece of gauze into the wound and approximating the thighs. This failing, M. L. Harris suggests acupressure made by passing long needles around the bleeding surfaces, with counter-pressure in the vagina. (5) *Injuries of the Soft Structures.*—In a number of reported cases lacerations of the urethra, bladder, and vagina have been noted as occurring during the extraction of the child. Such accidents are largely unnecessary, and may be avoided by a careful extraction of the child in the axis of the parturient canal, whereby the deep perineal fascia is not subjected to excessive strain: lacerations of the soft tissues can occur only when this fascia has been ruptured. Incontinence of urine may follow extensive laceration of the urethra.

CESAREAN SECTION.—This is an extraction of the fetus through an incision in the median abdominal line and the uterine wall when delivery through the normal passages is impossible. There are certain so-called *absolute indications* for the performance of Cesarean section that exist when the delivery of the fetus by any other method is absolutely impossible and the operator has no choice in the selection of the method of delivery. The absolute indications are—extreme degrees of pelvic contraction, as when the conjugate diameter measures 6½ cm. (2.5590 in.) or under; the presence of large bony growths or exostoses in the pelvis, or of large fibrous or myomatous tumors of the uterus; extreme atresia of the lower genital tract, either congenital or acquired; the presence of certain irreducible vaginal tumors; or the occurrence of a grave accident in labor, as rupture of the uterus or sudden maternal death. The advance in obstetric surgery, resulting in a lessened death-rate, has largely diminished the so-called *relative indi-*

cations in which Cesarean section is the operation of election to the exclusion of other more objectionable operations. One would be justified now in considering any condition that would prevent the delivery of a living child by natural means or by the minor operative procedures as an absolute indication for the performance of Cesarean section, with the view of preserving fetal without undue risk of maternal life. With the adoption of such a view craniotomy on a living child and Cesarean section change places, and the former becomes the more objectionable of the two. With the brilliant showing of the statistics of the improved Cesarean section, craniotomy should be relegated to those cases in which fetal death is assured. The final decision of such a question must never be assumed by the accoucheur, however: after a full explanation of the situation he should submit the matter to the friends of the patient and throw upon them the responsibility of the course pursued. *Time of Operation.* — The operation may be performed either before or during labor or after the mother's death. The preferable time under any of the absolute indications is from two to four weeks before term, when it is called the *elective* Cesarean operation. In order to secure a dilated or dilatable cervix at this time a hard-rubber bougie should be introduced into the uterine cavity a few hours before the time set for operation, and labor-pains be thus instituted. In cases in which the patient be not seen until actually engaged in labor, the operation should be performed as early as possible in order to avoid the profound exhaustion that invariably attends neglected cases and adds so materially to the mortality of the postponed operation. *Postmortem Cesarean section* is readily performed, and should be done, in late pregnancy, immediately after the death of the woman. The fetal viability is destroyed, as a rule, shortly after, or at the most within thirty minutes after maternal death.

Varieties of the Operation.—The *simple* or original Cesarean section consisted in a median abdominal incision

followed by incision of the uterine wall and extraction of the fetus and its appendages, after which the uterus was allowed to contract and the abdominal wound closed. The *improved Cesarean section* includes the modifications of this primitive operation as suggested by Sänger, Müller, and Porro. With the aim in view of preventing leakage of the uterine secretions and hemorrhage into the peritoneal cavity, Sänger suggested closure of the uterine wound in the manner hereafter described. This, which is known as the *conservative Cesarean section*, should be done in every case in which it is deemed best to preserve the uterus after extraction of the fetus. In order to prevent the escape of any of the liquor amnii or uterine secretions into the peritoneal cavity, Müller suggested that after the incision in the abdominal walls the uterus should be lifted in its entirety from the abdominal cavity and secured by hot towels packed around it. The fetus and its appendages may then be removed, and the section concluded as a Sänger or a Porro operation. Porro suggested that in all cases in which the absolute indications for Cesarean section exist, the proper procedure would be the extraction of the fetus in the usual manner, followed by extirpation of the uterus and its appendages, in order to prevent a subsequent impregnation. The *indications* for the Porro operation may be stated as follows: (1) Extreme degrees of pelvic contraction; (2) marked atresia of the cervix, vagina, or vulva; (3) the presence of large bony growths in the pelvic canal; (4) large fibrous or myomatous tumors of the uterus; (5) extensive rupture of the uterus, with involvement of adjacent structures and profuse hemorrhage; (6) a relaxed and flabby condition of the uterus after the section, predisposing to postpartum hemorrhage; (7) a septic condition of the uterus, with threatened general septic infection.

The *instruments required* are those that are needed in any celiotomy. They include a large scalpel; a pair of scissors; a pair of dissecting-forceps; a grooved director; half a dozen hemostatic forceps; some curved needles; a needle-holder;

some ligatures (fine catgut, silk, and silkworm gut); a number of sterilized towels; iodoform-gauze in strips 2 inches in width; a piece of india-rubber tubing 2 feet in length; two stump transfixion-needles. Four assistants are required—one to administer the anesthetic, one to assist in the operation, one to attend to the instruments and sponges, and one to take care of the child. The temperature of the room should be from 75° to 80° F.

Preparatory Treatment (when possible).—(1) Evacuation of the bowels by mild laxatives for two or three days prior to the operation; (2) thorough asepsis of the vagina and abdomen, including shaving of the pubes, disinfection of the umbilicus, and a vaginal douche of mercuric-chlorid solution, 1 : 2000; the abdominal surface is prepared as for symphysiotomy; (3) catheterization of the bladder immediately before the operation; (4) the primary injection of 1 dram of ergotin into the thigh. *Steps of the Operation.*—(1) The patient is placed in the dorsal position, and the entire abdomen, except the field of operation and the upper portion of the thighs, is covered with sterilized towels. (2) The operator, standing to the right side of the patient, with the large scalpel makes an incision through the linea alba down to the uterus: this incision may be enlarged until about 6 inches in length, extending almost to the symphysis pubis and an inch or two above the umbilicus. (3) Müller's procedure of lifting out the uterus is next performed, and warm sterilized towels are packed into the abdominal wound around the lower portion of the uterus, to prevent the escape of blood or amniotic fluid into the peritoneal cavity. (4) *Incision into the Uterus.*—The uterus being steadied by the assistant, who also grasps the vessels of the broad-ligament on both sides in order to temporarily control hemorrhage as far as possible, an incision from 4 to 5 inches in length is rapidly made in the anterior median line of the organ. This will be sufficiently large to permit of the ready extraction of the child. The hemorrhage fol-

lowing this incision will be quite profuse, notwithstanding the compression exerted upon the vessels; especially will this be the case should the placenta be situated under the line of the incision, as not infrequently happens. Rapidity of action is therefore very essential, and the child is grasped by the most accessible portion of its body—usually by the extremities — and immediately extracted. A ligature is thrown around the cord—or two clamps are applied—and it is severed, the child being handed to the assistant specially intended for its care. Attention is now directed to the placenta, which, together with the membranes, usually peels off very readily as a result of the rapid contraction of the uterine walls. (5) *Treatment of the Uterus.*—The termination of the operation depends entirely upon concomitant conditions. If it be desirable to retain the uterus, the procedure suggested by Sänger will be adopted; if there exist some reason why a subsequent impregnation is undesirable, a Porro operation must be performed. *The Sänger operation* consists in closure of the uterine wound—after thorough cleansing of the cavum uteri with a 2 per cent. creolin solution—by two tiers of sutures, the *primary* or *deep*, that pass through the muscular walls down to the mucosa, and the *secondary*, *superficial*, or *seroserous*, that are intended merely to effect accurate coaptation of the peritoneal edges, thereby effectually preventing leakage of blood or fluid into the peritoneal cavity. The uterus is first temporarily packed with gauze. The deep sutures (of strong silk, No. 4 or 5) are placed about ½ or ⅔ of an inch apart, and to expedite their insertion it is suggested that they be introduced as a continuous suture, the loops being left about 4 inches in length: when the loops are cut a row of interrupted sutures is left for tying. The seroserous sutures (of fine silk or catgut, No. 1) are introduced, according to the Lembert method, at intervals of a quarter of an inch, to secure absolute union of the peritoneal surface: they may also be inserted as a continuous suture, and many operators prefer to

employ the *buttonhole stitch*, which is made by placing the thread beneath the point of the needle before it is drawn through. The adhesions that form close the wound permanently within eighteen to twenty-four hours. The iodoform-gauze in the uterine cavity is retained there for twenty-four hours: it prevents further hemorrhage and acts as a means of drainage. *The Porro operation* consists in amputation of the uterus at the cervical junction immediately after the extraction of the fetus. The methods of performing this operation are two, based upon the manner in which the pedicle is treated. These methods are known respectively as the *intraperitoneal* and *extraperitoneal* methods. The former is the more perfect operation, but is dangerous if the operator be not well versed in the intricacies of abdominal surgery: in the hands of an experienced surgeon, however, it is the preferable method. The extraperitoneal method is readily performed, and, the stump being absolutely under control, any hemorrhage that may supervene can be thoroughly controlled. It is open to the serious objection that it imposes upon the patient a prolonged and tedious convalescence, with increased danger of septic infection and more or less distortion of the pelvic contents and disfigurement of the abdominal wall. The steps of these two operations are as follows: 1. *The intraperitoneal method of treating the stump.* The fetus having been extracted, the operator secures perfect hemostasis by ligating first the ovarian and then the uterine artery on each side, the sutures being passed through broad-ligament tissue only, whereby their subsequent loosening from the contraction of enclosed cervical or uterine tissue will be avoided. The uterus is then excised from the broad ligament on both sides, its peritoneal covering incised before and behind, and the cervix amputated by a transverse V-shaped incision, forming a posterior and an anterior flap: these are united by two or three sutures. There are thus formed three stumps—one of the broad ligament on each side, and that of the cervix below.

Hemostasis being assured, the pedicles are dropped into the peritoneal cavity, which is then flushed with sterilized water, and the abdominal wound is closed. 2. *The extra-peritoneal method of treating the stump.* Should the foregoing method not be adopted, the operator may proceed as follows: The uterus having been lifted from the abdominal cavity, according to Müller's suggestion, the india-rubber tubing is passed over the fundus and secured firmly around the cervix as low as possible, any adjacent intestinal loop being avoided. The ends of the tubing are drawn tightly, whereby all circulation within the uterine walls is controlled. The objection to the use of this tube when a simple Sänger operation is intended is the subsequent temporary paralysis of the uterine tissue that almost invariably follows, with consequent predisposition to hemorrhage. The ligature being applied, the uterine incision is then made, the fetus and placenta are extracted, and, the uterus having shrunk considerably, the rubber ligature is again drawn taut and the knot made secure by one or two additional ties. The transfixion-needles are now passed through the cervix at right angles just above the ligature, and the uterus is excised from one-half to three-quarters of an inch above the needle. The stump thus prepared is next secured at the lower extremity of the abdominal wound. (6) *The Toilet of the Peritoneum.*—The uterine operation having been completed by one of the three foregoing methods, the peritoneal cavity must be thoroughly flushed with warm sterilized water, which may be drained off through a sterilized glass tube, moderate pressure being exerted at the same time upon both flanks to force out whatever fluid may remain. It is not absolutely essential that all the water be removed, for the peritoneum is fully able to dispose by absorption of the small amount that may be left. (7) *Closure of the Abdominal Wound.*—In the simple Sänger and the intraperitoneal Porro operations this is the same procedure as after an ordinary abdominal section.

Interrupted sutures of silkworm-gut are placed at intervals of half an inch, each suture passing through all the coats of the abdominal wall, including the peritoneum. Care must be observed to include a goodly portion of the muscular tissue in order to avoid subsequent development of a ventral hernia. From eight to twelve of these deep sutures will be required. When they are applied, superficial approximation-sutures, including merely the cutaneous and upper muscular layers, must be passed midway between the deep sutures to secure accurate adaptation of the skin-flaps. When the extraperitoneal Porro operation has been adopted, the lowest deep suture of the abdominal incision must be caused to traverse the stump a short distance (¼ to ½ inch) below the rubber ligature: this secures the stump in place and closely approximates the abdominal wall thereto. (8) *The Antiseptic Dressing.*—When there is no external stump the dressing is that employed after every abdominal section. The site of the incision and the surrounding abdominal surface are bathed in sterilized water and well dried. A thick dusting of acetanilid, iodoform, or aristol is made over the incision, the umbilicus, and the pubes; several layers of moist antiseptic gauze are placed above this, and over all a thick layer of dry gauze. This dressing is securely held in place by strips of adhesive plaster of sufficient length to reach from flank to flank. A many-tailed bandage may then be applied and the patient placed in a prepared bed. The dressing for the stump, when this is secured in the abdominal wound, includes accurate trimming of its edges; suturing together of the peritoneal edges, to reduce as far as possible the size of the raw surfaces; the placing around it of a square of rubber dam; and the application of some drying and antiseptic powder, as acetanilid, equal parts of acetanilid and iodoform, aristol, or equal parts of iodoform and tannic acid. Over this are placed some layers of gauze, and over all the dressing as already described. The stump will require daily dressing

until it sloughs off in from ten to fifteen days; the wound remaining must then be dressed with rigid antiseptic precautions.

Mortality of Cesarean Section.—Improved technic and better knowledge of the surgery of the abdominal cavity have wrought a marvellous change in the mortality of this grave operation. In the hands of the most skilled operators the maternal mortality of the Sänger-Cesarean section to-day is about 8 per cent., while Porro's operation is attended by a maternal mortality of 37.78 per cent. and an infantile mortality of 22.4 per cent. The *causes* of infantile death are asphyxia from occlusion of the placental circulation or from pressure upon the cervical vessels by the contracting uterus, and traumatism during the process of extraction. Maternal death results from shock, exhaustion, peritonitis, septicemia, and hemorrhage.

After-treatment of Cesarean Section.—The after-treatment of this operation is essentially that of an ordinary abdominal section. The patient is kept in the dorsal position for forty-eight hours, and without a pillow for at least twenty-four hours. At the end of eighteen or twenty hours a pillow may be placed under the knees to alleviate the pain induced by the prolonged dorsal decubitus. An injection of $\frac{1}{8}$ or $\frac{1}{6}$ grain of morphin sulphate should be administered immediately after the operation to diminish the shock and to overcome some of the pain that always follows an abdominal section. No food should be allowed for at least twenty-four hours. The intense thirst may be partially relieved by sips of warm water and by frequent moistening of the lips by a cloth wrung out of cold water or containing small pieces of ice. At the expiration of twenty-four hours dram doses of barley-water, alternating with dram doses of milk and lime-water, may be administered at frequent intervals (one or two hours), and the quantity gradually increased as the patient's stomach can tolerate it. Should nausea and vomiting ensue, all alimentation by the

mouth must be stopped and rectal enemata given. At the end of forty-eight hours small quantities of beef-juice or peptonized milk may be administered. If the bladder be not evacuated at the expiration of eight hours, a sterilized catheter must be introduced, and this is repeated at eight-hour intervals as required. The child should be given the breast as in normal cases. Unless unfavorable symptoms (tympanites, pain, rapid pulse, vomiting) supervene, the bowels should not be opened until the evening of the second or the morning of the third day. At that time calomel in minute doses ($\frac{1}{6}$ or $\frac{1}{4}$ grain) may be given every half hour or hour until there result an inclination to a bowel-movement, which may then be facilitated by the administration of a rectal enema of soapsuds containing, if desired, a small amount of glycerin and turpentine: the bowels once patulous, they should be so maintained. If a Sänger operation have been performed, the intrauterine tampon must be removed at the expiration of twenty-four hours, and a second introduced with great care, should there exist any tendency to hemorrhage; otherwise the simple occlusive dressing may be placed over the vulva and the woman treated as an ordinary puerperal patient. *Removal of the Sutures.*—The abdominal sutures should be removed on the usual day, the tenth, unless extreme tympanites indicate an earlier removal of one or two to relieve tension. The usual antiseptic dressing is then applied and the abdominal binder firmly secured. The latter must be constantly worn for at least twelve months in order to secure firm union, thereby preventing the formation of a ventral hernia, and also tending to preserve the normal degree of rotundity and tonicity of the abdominal walls. The patient may be propped up in bed on the twelfth or fourteenth day, and at the expiration of an additional week or ten days may be permitted to leave her bed, but not the room. The convalescence may be protracted, and during this time the patient must be guarded and treated in the usual postoperative manner.

(*b*) *Malformations of the Uterus.*—Any variety of uterine deformity may be productive of degrees of difficulty in parturition varying according to the amount of uterine distortion present. Fortunately, most of the cases of impregnation in a double uterus induce long before term symptoms of such gravity that the artificial termination of gestation becomes imperative. Very exceptionally, such a uterus may permit of sufficient dilatation to allow the pregnancy to continue uninterruptedly to term. When the woman falls into labor in such a case, while it is true that parturition may be uncomplicated, she is exposed to the double risk of hemorrhage and obstruction to fetal expulsion. The latter will occur when the unimpregnated uterus is so rotated and displaced downward as to fill the pelvic cavity. The obstruction may become insuperable, in which case uterine rupture will be imminent unless artificial assistance be afforded. Hemorrhage may occur from rupture of the attenuated uterine wall, or it may follow partial separation of the placenta, especially when the latter is attached to the inner wall of the uterus—that adjacent to the unimpregnated side: the latter, not undergoing the vigorous contractions of the opposite side, will fail to sufficiently compress the lacerated sinuses, and active hemorrhage may ensue. In such a case rapid evacuation of the uterine contents is imperative, followed by thorough tamponade of the bleeding cavity and the administration of ergotin hypodermically and by the mouth. Should laceration of the uterus have occurred, it must be treated according to the condition that may be present.

Under the heading of uterine malformations may be mentioned the so-called *antepartum hour-glass contraction* (Hosmer), or *tetanoid falciform constriction of the uterus* (Harris), an extremely rare condition in which there exists an absolutely nondilatable internal os: as a result of this obstruction the uterus promptly falls into a condition of tetanic contraction and rupture becomes imminent. The

treatment consists in the administration of large (15-grain) doses of chloral to induce softening of the cervical tissues. This failing, complete narcosis from ether or chloroform should be induced, and the fetus extracted by forceps or by podalic version, irrespective of the danger of cervical laceration. It may be that Cesarean section will be required before delivery can be accomplished.

(*c*) *Uterine Displacements.*—As has already been remarked, a considerable degree of obstruction to labor may be induced by the various displacements of the gravid uterus. The cause of the difficulty is purely mechanical, and the remedy is patent. As far as possible the displacement must be corrected, after which the labor will progress satisfactorily. The axis of an antedisplaced uterus may be made to approximate more closely to that of the parturient canal by a firmly-applied abdominal bandage; that of a laterally deviated uterus may be straightened by a large compress placed under the uterus while the patient lies upon that side to which the fundus is directed. Should a prolapsed uterus fail to assume its normal position during the progress of labor (Fig. 151), the use of the forceps may become necessary to accomplish the delivery of the fetus. The only treatment applicable to that rare condition, sacculation of an incarcerated retrodisplaced pregnant uterus, is podalic version, extreme care being taken not to rupture the immensely attenuated anterior wall. The feet in such a condition are generally just within the os, within ready access, and version may be accomplished with unusual ease.

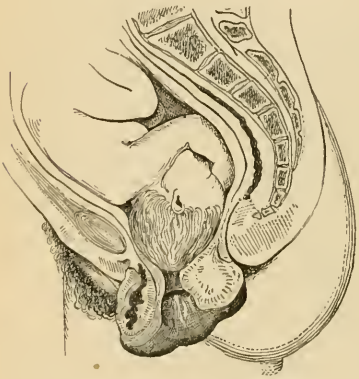

FIG. 151.—Partial prolapse of the womb and hypertrophy of the cervix (Faivre).

(*d*) *Tumors—Uterine, Cervical, Pelvic, and Vaginal.*—A very serious obstruction to labor results when the parturient canal is blocked by neoplasmata, benign or malignant. These growths may be situated at any point in the birth-canal, and when present generally constitute an insuperable obstruction to the descent of the child. The body of the uterus itself may be the seat of fibromata or myomata of varying size. The degree of obstruction arising from such tumors will depend largely upon their situation. A fibroid tumor of considerable size may be situated near the fundus, and, aside from the increased bulk thereby produced, give rise to absolutely no trouble. Again, although situated in the lower uterine segment, if in the anterior wall of the uterus the tumor may be carried upward out of the pelvic cavity by the vigorous uterine contractions, and labor proceed in a perfectly normal manner. When such a growth, however, is situated low down in the posterior uterine wall, it becomes impacted under the sacral promontory and constitutes an absolute obstruction to labor. Even should the tumor be displaced during the delivery of the child, it is a constant menace to the safety of the patient. Thus, in the progress of labor the growth may be subjected to such pressure that its vitality, at the best low, will be so impaired that it will undergo sloughing, and cost the woman her life from suppurative peritonitis. Again, it may so interfere with the process of uterine contraction and involution that convalescence will be protracted, and the woman subjected to the risks of hemorrhage and sepsis and the suffering dependent upon irregular uterine contractions. The *treatment* of these uterine tumors will vary according to the time at which they are first encountered. If the patient be seen early in pregnancy, the induction of abortion is justifiable in order to avoid the greater dangers attendant upon labor at term; or a myomectomy may be performed and the pregnancy allowed to proceed, if it will do so. If the patient be seen

at term, and the tumor be pedunculated and situated in the most favorable position—on the anterior wall—postural treatment (the woman in the knee-chest position) may, with the aid of suitable manipulations, carry the tumor up out of the pelvic cavity and into such a position that it will be subjected to a minimum amount of pressure. If this cannot be accomplished, the progress of labor must be carefully watched and Cesarean section performed if the tumor fail to retract into the abdomen under the influence of the uterine contractions. Generally, Cesarean section is the only procedure available, and this must be performed as soon as the woman falls into labor. It is interesting to note that, owing to the distortion of the uterine cavity by the abnormal growth, unusual positions of the fetus—as presentation of the breech or a transverse position—are by no means uncommon, and contribute still more to the difficulties of the case.

Fibrosarcomata of the uterus are occasionally noted. They assume an unwonted rapidity of growth under the stimulus of pregnancy, and may attain enormous dimensions. The only treatment is the Porro operation, performed when the nature of the new growth is ascertained. The cervix uteri may be the seat of mucous polypi, fibroid tumors, or carcinoma. The *mucous polypi* must be snared off immediately after the woman falls into labor, as must also the fibroid growths if they be pedunculated; if sessile and partially intraligamentous, a Porro-Cesarean section is the only proper course of treatment. *Advanced carcinoma* may induce such a degree of cervical rigidity from cellular infiltration that labor will be absolutely impeded; therefore it becomes perfectly justifiable to induce abortion or premature labor immediately upon the confirmation of the diagnosis. In case the condition be first noted at the onset of labor, the progress of cervical dilatation must be closely watched, and should the os not dilate, radiating incisions may be made in the hardened tissue to the extent of about one-fourth of an

inch. If dilatation will not then follow, a Cesarean section becomes imperative, after which total extirpation of the uterus should be performed, provided there have not occurred an extension of the disease to the vaginal tissues.

Among the tumors encountered within the pelvis, and occasionally constituting an obstruction to parturition, are ovarian cystomata, sarcomata of the pelvic bones, bony exostoses, and splanchnic displacements. *Cysts of the ovary* that are most likely to cause serious obstruction to labor are those of small and medium size that have not yet ascended into the abdominal cavity, and that generally, not causing symptoms, are unsuspected before the advent of labor. They occupy a position low down in the pelvis behind the uterus. In cysts of the smaller size the obstruction may not be absolute, but the patient is subjected to the same danger as in uterine fibroids—namely, devitalization and suppuration of the cyst from pressure. The *treatment* of this condition may be stated as follows: 1. If the condition be discovered during gestation, an abdominal section should be performed: in a large percentage of cases pregnancy will not be interrupted by the operative procedure, especially if care be observed to manipulate the uterus as little as possible. 2. If the tumor be not discovered until the advent of labor-pains, and a more or less distinct pedicle exist, a postural method of treatment may succeed, the woman assuming the knee-chest position, and the presenting portion being made to engage after the dislodgement of the growth. This method will answer in a limited number of cases only. 3. Generally it will become necessary to puncture the cyst under thorough antiseptic precautions, draw off the fluid, and allow labor to proceed. The vagina must be cleansed with soap and water and douches of mercuric-chlorid solution (1 : 2000). An aseptic trocar is then introduced through the posterior vaginal fornix and the fluid allowed to escape: the cyst-walls collapse, the obstruc-

tion is removed, and the labor proceeds. An abdominal section may then be performed, and the sac removed in the usual manner. 4. Occasionally, owing to the gelatinous nature of the cyst-contents, aspiration of the sac will not suffice. It will then be necessary to perform a Sänger-Cesarean section, and follow this by enucleation of the ovarian cyst.

Sarcomata and *enchondromata* of the pelvic bones are fortunately of very rare occurrence. When present they so absolutely block up the pelvic canal that labor can only be terminated by a Porro-Cesarean section. Bony exostosis of the pelvis (*pelvis spinosa*, *Hauder's pelvis*, *acanthopelvis*, *acanthopelys*, *spiny* or *thorny pelvis*) is likewise exceedingly rare. The spinous pelvis is characterized by the presence at various portions of its structure of bony knobs, spines, spicules, ridges, and other outgrowths. The more blunt and rounded projections show a predilection for the sacroiliac synchondroses and the sacral promontory, while the sharper spines are generally attached to the pubic and iliac crests and to the iliopectineal eminences: this is not invariably true, however. The dangers attendant upon such a condition, aside from obstruction to labor when the growths have attained any considerable size, are perforation of the uterine walls during the descent of the head and injuries of the fetal skull. Should such a condition be discovered during early pregnancy, the induction of abortion would be justifiable; or, if the exostosis be of but small size, labor should be induced from four to six weeks before term, whereby serious injury to mother and child may be averted. In rarer cases Cesarean section may be required.

Renal dislocation has proved in a few recorded instances an almost insurmountable obstacle to the delivery of the child: the displaced organ, sinking to the pelvic inlet, has become lodged near the sacral promontory, where it has become incarcerated by the advancing fetal presentation. If such a condition be encountered, podalic version should

be attempted. This will probably succeed, the kidney being displaced upward as the fetus is dragged down. This failing, a Cesarean section must be performed and the displaced viscus returned to its normal situation.

There is quite a variety of *vaginal tumors* and analogous conditions that may cause more or less obstruction to labor. Prominent among these may be mentioned the various grades of colpocele, especially of the anterior wall when complicated with cystocele. The advancing presentation under these circumstances pushes the prolapsed and boggy tissues before it until quite a considerable protrusion, often assuming the appearance of a fluctuating tumor, is noted. The treatment of such a condition consists primarily in catheterization of the bladder, followed by an upward displacement of the prolapsed tissues. The presenting part may then be dragged down by forceps and further prolapse thereby prevented. In case the catheter cannot be passed, owing to the excessive distortion of the urethra, aseptic aspiration through the vaginal wall should be performed. *Posterior colpocele* is exceedingly rare. When encountered it is usually dependent upon constipation with an accumulation of scybala in the rectum. When these are removed by enema or by the spoon the obstruction disappears. *Vaginal enterocele* is also of very rare occurrence, but when encountered constitutes a serious obstruction to labor. The mass of bowel extends down the posterior vaginal wall, constituting in fact a prolapse of Douglas's cul-de-sac, and may even protrude through the vulvar orifice. The danger of such a complication is serious pressure of the bowel with ultimate gangrene. By appropriate taxis, the patient resting in the lithotomy or in Trendelenburg's posture, the hernia may be reduced, after which extraction of the fetus by forceps is indicated to prevent a return of the condition.

Vaginal cysts, if noted, must be punctured as soon as labor be initiated, and *vesical calculi* must be removed by incision through the vaginal wall in order to prevent sub-

sequent vesicovaginal fistulæ and injury to the fetal skull during its transit through the birth-canal. *Edema of the vulva*, if excessive, may be relieved by puncturing the tissues with a fine aseptic needle and allowing the exuded serum to be drawn away.

(*e*) *Rigidity or Atresia of the Soft Structures of the Parturient Canal.*—A not inconsiderable amount of difficulty may result from an undue tonicity or over-rigidity of the soft tissues of the lower birth-canal. Such a condition is especially noted in the case of elderly primiparæ or in hyperesthetic individuals, a true condition of vaginismus and perineal spasm existing in the latter. Probably the more serious results follow a nondilatable condition of the external os of the cervix uteri.

Rigidity of the cervix to a certain degree is by no means an infrequent occurrence. When present it is productive of a vast amount of suffering to the patient and of considerable anxiety and trouble to the accoucheur. It may arise from a number of causes. As has already been stated, it may be purely a neurotic condition, and is thus especially marked in elderly primiparæ and in highly neurotic women. This condition may assume a considerable degree of importance on account of the excessive suffering of the patient, which materially interferes with effective uterine contractions. In another comparatively infrequent group of cases the rigidity is a direct outcome of an early escape of the liquor amnii, the cervix not having been subjected to the gradual dilating influence of the bag of waters ("dry labor"): the attendant pain results mainly from the direct pressure exerted by the fetal presentation upon the cervical lips. Nondilatation very often results in these cases from failure of the presenting part to engage after the early rupture of the membranes, the orifice being insufficient to admit the blunt presenting portion. If the condition be not speedily relieved, it is not uncommon for the uterus to fall into a state of tetanic contraction, when all the

symptoms and dangers of grave obstruction to labor will supervene. Again, the rigidity may be due to ineffectual uterine contractions—the so-called primary uterine inertia—or to an abnormal induration or infiltration of the parts, either from the presence of cicatrices or from inflammatory products: it may be the result of constipation or distention of the bladder; it may be due to a premature onset of labor, the parts not yet being prepared for the escape of the fetus; or there may be a natural inelasticity of the tissues. Whatever the cause, the *symptoms* of cervical rigidity are the same. There is an exaggerated suffering on the part of the patient; the uterine contractions are irregular and deficient in power; the os fails to dilate; and the symptoms of obstruction supervene. A physical exploration will reveal the existing condition. The *treatment* will depend largely upon the cause of the rigidity. If it be neurotic, Playfair's treatment, as already described, is an excellent plan to pursue. Under the influence of the chloral the tissues rapidly soften, the nervousness is controlled, and the pains lose much of their irregularity and become stronger while more infrequent. The drug may be given by the mouth or in the form of a rectal suppository or enema. Hot vaginal douches directed against the anterior cervical lip are likewise very efficient in inducing more powerful uterine contractions, while at the same time causing rapid softening of the cervical tissues. In some highly sensitive women it may become necessary to administer small doses of a narcotic, or to deliver by instruments under an anesthetic after forcible digital dilatation, repairing immediately any cervical laceration that may result.

Rigidity of the perineum, or *perineal spasm*, is occasionally noted in primiparæ. It may likewise be purely a neurosis, but is generally due to a contracted pubic arch, which prevents close apposition thereto of the occiput: the latter is in consequence forced down upon the perineum, and a rupture of the floor results. In multiparæ it may excep-

tionally follow from the presence of cicatricial tissue due to an old laceration or some previous operation. When perineal rigidity exists to a moderate degree, it may be partially overcome by the frequent anointing of the parts with cocain-and-belladonna ointment. Gentle manipulation, together with the application of the methods of preserving the perineum already described, may prevent extensive lacerations. Should the latter occur, however, immediate repair is indicated.

Atresia, either *congenital* or *acquired*, may be found at any point from the internal os to the vulvar orifice. Atresia of the cervix is very rarely complete, and then is cicatricial in origin, resulting either from extensive laceration at a previous labor or operative procedure, or, more rarely, from severe cervical endometritis with erosion and adhesion of the lips, the latter taking place after impregnation has occurred. The degree of contraction may be so extreme that but a mere indentation will indicate the site of the external os. The *treatment* consists in hot vaginal douches and the administration of large doses of chloral. If the tissues do not yield before the pressure exerted by the presenting part, a uterine sound may be forced through the indentation, or two or three small radiating incisions made by a guarded bistoury (preferably under ether): the opening thus secured may be increased in size by the fingers. A certain amount of dilatation having been accomplished, the further progress of labor will be normal.

That variety of atresia, if such it may be termed, dependent upon a condition of hypertrophic elongation of the cervix is exceedingly rare. The dangers incurred under these circumstances are prolongation of the labor from slow dilatation of the os, and incarceration of the cervical lips between the symphysis pubis and the fetal head, with edema and, it may be, ultimate sloughing of the devitalized tissue. It is possible for an almost complete obstruction to follow such a condition, and cases are on record of the

performance of Cesarean section to overcome the difficulty. Such a termination, however, will scarcely ever be justifiable. The usual measures should be adopted to induce softening and complete dilatation of the parts, and when this has been accomplished, efforts must be made to displace the elongated lips above the presenting part, where they will escape any excessive pressure. To accomplish this it may become necessary to make numerous radiating incisions, or even to amputate a portion of the redundant tissue. The pressure of the fetal head, which must then be delivered by forceps, will arrest any undue hemorrhage, and after the delivery of the child the bleeding vessels may be immediately ligated.

Atresia of the vagina, or colpostenosis—a congenital condition or the result of lacerations during previous labors, obstetric or gynecologic operations, or phagedenic ulceration—may exist in any degree, from that constituting a trivial obstruction to labor, to an almost complete obliteration of the canal. The minor degrees of contraction usually yield readily before the advancing part. It may, however, become imperative to dilate the constricting bands by the Barnes or the Champetier bag, by numerous incisions (care being taken to arrest any hemorrhage), or by instrumental delivery. In the graver cases a Cesarean section may be required.

Vulvar obstruction may be due to cicatricial contraction, to agglutination of the lips from some severe inflammatory process occurring during gestation, to an extensive hemorrhoidal condition, to marked edema of the parts, or to a persistence of the hymen. Cicatricial contraction must be overcome by free incision with dilatation by Barnes' bag or by the fingers, followed by instrumental delivery of the fetus. The agglutinated lips must be freed by incision, and after the delivery of the child the parts separated by pledgets of antiseptic gauze. The hemorrhoidal or thrombotic obstruction may be largely averted by a proper atten-

tion to the bowels during the later weeks of gestation. Should a large effusion of blood occur, the mass must be evacuated by an incision, the fetus delivered at once by forceps, and the bleeding points ligated. Subsequently great care must be exercised to avoid septic infection. *Edema of the vulva* is rare, and is generally a concomitant of renal disease. Not only will the labia be immensely swollen, but the edema may even extend to the abdomen or down the thighs and into the perineum. The obstruction may be relieved by numerous aseptic punctures of the edematous tissue whereby the exuded serum may drain away. Very generally a persistent hymen will yield before the advancing part: nothing, therefore, need be done in this condition unless the hymeneal structures be of unusual density, when one or two radiating incisions will remove all obstruction.

(4) **Maternal Accidents.**—(*a*) *Rupture of the Birth-canal.*—The most common accident to the parturient woman is rupture or laceration of some portion of the birth-canal. Fortunately, such a complication is most likely to occur in the lower parturient canal, involving the cervix, vaginal walls, or perineum, where it is attended with the minimum amount of danger and is most accessible to treatment. Rarely, however, the upper portion of the canal yields, and that alarming condition, rupture of the uterus, must be dealt with. These various forms of rupture, together with the marginal variety of placenta prævia and adherence of the placenta, give rise to that complication known as *intrapartum hemorrhage.*

Rupture of the uterus is a laceration of some portion of the uterine wall occurring during the process of parturition, and giving rise to hemorrhage, pain, and collapse. This is an exceedingly rare accident of labor, occurring not more than once in 4000 cases. Rupture of the uterus may occur during pregnancy and during the puerperium, as well as in labor itself. Thus the mere stretch-

ing of the uterine wall by the developing fetus may induce the so-called *spontaneous rupture* of the uterus as already described; or a rapidly developing cystic degeneration of the chorion may involve so much of the uterine muscle as to result in perforation of the wall. When the accident occurs during the puerperium it can result only from one of two conditions: either the woman is septic and suffering from a dissecting metritis with purulent foci in the uterine walls, one of which has yielded, or there has been a nipping of a portion of the wall between the pubic bones or a projecting exostosis and the fetal head, resulting in so much devitalization of the tissues that an extensive sloughing has occurred. *Etiology*.—The exciting causes of uterine rupture during labor are some insuperable obstruction to the delivery of the child, misdirected or injudicious efforts at version or other obstetric manipulation, and tetanic action of the muscle of the upper uterine segment produced by the administration of ergot during the early stages of labor. This includes all that has been considered under the subject of obstructed labor. This accident is especially liable to occur when certain predisposing causes, maternal and fetal, exist. The *maternal* predisposing causes are—frequent childbearing, resulting in a diminished tonicity of the uterine walls; undue prolongation of labor, resulting in exhaustion or paralysis of the uterus; some variety of uterine deformity, as bicornate uterus. The *fetal* predisposing causes are—male sex of the child, from the concomitant over-size and more rigid cranial ossification; hydramnios; and malpresentations. The *site* of the rupture varies, but it is always low down in the lower uterine segment, generally upon the posterior wall, and very frequently to the left of the median line. It is generally situated transversely to the uterine axis or sometimes obliquely, and may extend from its point of origin into the upper segment, and even involve the fundus uteri. The latter situation is exceedingly rare, and usually occurs when uterine deformity is present or

when there has preexisted at this point some variety of uterine traumatism: this, therefore, is the usual seat of rupture during gestation. That occurring during labor is usually situated low down, near or slightly above the cervix. The extent of the tear varies from a slight yielding of the muscular coat only (*incomplete rupture*) to a rent involving the entire length of the uterus and penetrating into the peritoneal cavity (*complete rupture;* Fig. 152).

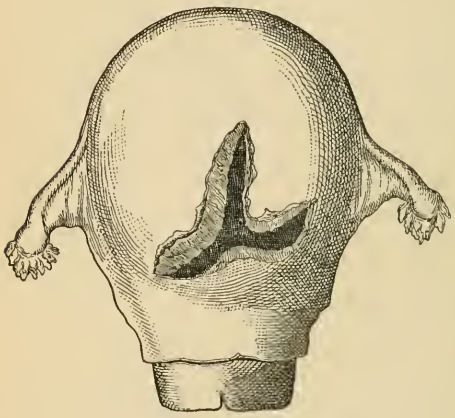

Fig. 152.—Complete rupture of the uterus (Auvard).

Occasionally all the tissues yield with the exception of the peritoneal coat: in this case the hemorrhage that results collects under the delicate serous tissue as an extrauterine and, at the same time, extraperitoneal hematocele, no communication having been formed with the free abdominal cavity. Again, though very rarely, the rupture may be confined entirely to the peritoneal coat, the patient rapidly bleeding to death. Some observers remark that the longitudinal tears are more frequent and are caused by shoulder presentations, while circular tears result generally from contracted pelvis. The accuracy of this statement has not been positively demonstrated. *Symptoms of Uterine Rupture.*—Rupture of the uterus does not occur abruptly in obstructed labor. Parturition begins in a natural manner, the woman experiencing normal uterine pains of average severity. The membranes finally rupture and the liquor amnii escapes, but the solid contents of the uterine cavity

—either because of some malposition of the fetus, as a transverse presentation, or other form of obstruction, as a pelvic contraction, fibroid tumor, or over-size of the fetal head—cannot engage in the superior strait. The uterine contractions become more frequent and more severe, the upper uterine wall becoming dense as the pains increase in severity. Owing to the somewhat fixed position of the cervix below, the intervening portion of the body of the uterus—the lower uterine segment—stretches as the upper segment retracts, and the thinning of this segment manifests itself clinically by an ascent of the contraction-ring of Bandl, which is to be recognized as the premonitory sign of uterine rupture, and which, when once discovered, constitutes a positive contraindication to any obstetric maneuver that will throw additional strain upon the already overtaxed lower segment. Podalic version cannot be attempted when such a combination of circumstances exists.

Should the condition still be overlooked, notwithstanding the discovery of the furrow across the anterior uterine wall, the pains will become almost, if not entirely, one continuous tonic contraction, the woman's sufferings will be intense, and the abrupt onset of a characteristic group of symptoms will indicate a yielding of the over-distended uterine wall. During the height of an intense uterine contraction the woman will experience an acute agonizing pain, causing her to emit an ear-splitting shriek. This, it is said, may be accompanied by a sound of tearing tissues audible not only to the patient herself, but to those in attendance in the room. Instantly there will occur an absolute cessation of all uterine contractions, and the patient will almost immediately fall into a state of collapse with symptoms of internal hemorrhage. Her expression is anxious; the pulse becomes exceedingly rapid, small, and irregular; the face is pallid, the skin moist and cold; respiration is shallow and rapid, and usually air-hunger is noted; there is a tendency to nausea and vomiting; muscæ volitantes and tinnitus aurium

are complained of; and in neurotic individuals one or more convulsions may be noted, the woman rapidly falling into a state of coma. There may occur a free hemorrhage from the vaginal canal, or this may be entirely absent, the blood escaping into the abdominal cavity. Not infrequently the presenting fetal part will be found to have disappeared from the internal os, while in its place may be felt a ragged rent through which may protrude one or more loops of intestine. Palpation may also discover in rare instances a certain amount of subperitoneal emphysema on the anterior or lateral aspects of the uterus. This results from putrefactive changes or from the entrance of a small amount of air beneath the peritoneal investment.

The *diagnosis* of this serious accident is to be made mainly by a physical exploration after the appearance of the foregoing group of symptoms. The state of collapse, the recession of the presenting part, the presence of two distinct abdominal tumors, the hemorrhage, and the detection of the rent by digital exploration will at once reveal the condition. Occasionally, when the fetal part is not displaced and there exist only the symptoms of hemorrhage and collapse, the accoucheur may be called upon to differentiate between complete and incomplete uterine rupture and premature detachment of the placenta. Each of these accidents is attended by profuse hemorrhage, and each induces collapse. There are some points in the history, however, that will aid in the diagnosis. The points of differentiation from accidental hemorrhage have already been noted.

From *incomplete rupture:*

Complete Uterine Rupture.	*Incomplete Rupture.*
There will be an escape of a portion of the fetus into the abdominal cavity, where it may be palpated and its parts recognized.	There will be a protrusion to one side of the uterus, consisting of the fetus surrounded by the unruptured portion of the uterine wall. The fetal parts cannot be clearly outlined.
The additional tumor is movable.	The uterine projection is immovable.
The fetal presentation will recede.	The fetal presentation will persist.

Prognosis.—No more serious condition than this can be encountered in the practice of obstetrics. If unrelieved, as is generally the case in the usual country practice, fully 90 per cent. will perish, death following almost immediately from shock or primary hemorrhage, or within two or three days from repeated secondary hemorrhage or the development of septic peritonitis. Under the improved methods of treatment the mortality in the best hands is still as high as 55 to 60 per cent. Several complications may exist and add materially to the gravity of the case. Thus the rent may involve the rectum, in which case there may occur an escape of feces into the peritoneal cavity; or the bladder may be lacerated simultaneously, with an escape of urine into the pelvic cavity or a gradual infiltration into the surrounding tissues, and resultant gangrene of the parts; a loop of intestine may slip through the rent into the uterine cavity, and there be incarcerated by the uterine contraction, the woman perishing from intestinal obstruction with gangrene; marked pelvic and abdominal emphysema may aggravate the case, or an immense hematocele may rupture secondarily, causing sudden death from hemorrhage, or it may suppurate, with the production of a late septic peritonitis. The *fetal* mortality is at least 95 per cent., death resulting from asphyxiation from interference with the feto-placental circulation or from obstetric manipulations.

The *treatment* consists in the adoption of stringent prophylactic measures: this will necessitate an absolute diagnosis of the existent condition before labor commences and during the progress of its initial stages. The judicious employment of anesthetics in neurotic individuals in whom there is manifested a tendency to tetanoid uterine contractions may avert much trouble. In minor degrees of pelvic contraction a close watch must be kept over the uterine contraction, and a rise of Bandl's ring will constitute an urgent indication for the artificial termination of labor either by forceps or by perforation in case of fetal death. In

neglected transverse presentations version is absolutely contraindicated, and the only resource left will be decapitation. The fundamental principle in all cases of threatened uterine rupture is early termination of labor irrespective of fetal risk, and by the method most conducive to maternal safety. Rupture having occurred, the active course of treatment only should be adopted. As already stated, the expectant method is almost certain to result in maternal death, while absolutely fatal to the offspring. The exact course to pursue will depend entirely upon the extent of the rupture and the amount of fetal displacement. It must be borne in mind that rupture of the uterus does not necessarily imply rupture of the fetal sac at the same point, and while the sac remains intact above there can be no escape of the amniotic fluid or other uterine contents into the free peritoneal cavity, although there may exist a protrusion of the membranes through the rent. If this favorable condition exist, the accoucheur is perfectly justifiable in adopting the least radical procedure that the exigencies of the case will permit. Merz of Basel, who has made an exhaustive study of uterine rupture, has suggested a plan of treatment under various conditions that may be offered as the general consensus of opinion of the leading obstetricians and abdominal surgeons. Briefly stated, this (somewhat modified) is as follows: 1. If the fetus be lying within the uterus, podalic version should be performed at once and the child rapidly extracted. A careful examination must then be made as to the site and extent of the rent: if it be low down, small, and absolutely closed by the uterine contractions, and especially if it be situated posteriorly, an expectant course of treatment may be adopted. This will include an immediate evacuation of clots and shreds of membrane, the administration of a douche of warm sterilized water or of a weak solution of creolin (½ per cent.), the administration of one or more hypodermic injections of ergotin, the introduction of a strip of iodoform-gauze to the fundus

uteri, and the application of a firm abdominal binder. The gauze may be removed at the expiration of twenty-four or thirty-six hours. Upon the first indication of peritonitis an abdominal section must be performed and the peritoneal cavity flushed with hot sterilized water. A high situation of the rent will contraindicate the adoption of this plan of treatment, as will also a tear in the anterior uterine wall (Lusk remarks that all such tears invariably terminate fatally). 2. When the rent is large and a portion of the fetal body has escaped into the abdominal cavity, the head, however, remaining fixed or resting just above the pelvic brim, forceps should be applied and the child rapidly extracted. This failing, abdominal section must be performed, the child removed, and, if possible, the rent closed according to the Sänger method. The abdominal cavity must then be irrigated and the patient treated as a case of simple Cesarean section. 3. If the entire fetus have escaped into the abdominal cavity, or the lower portion alone remain in the uterine cavity, abdominal section must be performed at once, the child removed, and the uterine rent sutured. 4. If the rent be extensive and ragged, involving adjacent structures, or if there exist a septic condition of the parts, a Porro-Cesarean section, or, better still, a total extirpation of the uterus with complete closure of the peritoneal cavity, is the only plan to pursue. Laceration of the bowel or bladder must be repaired in the usual manner by the Lembert suture.

The *after-treatment* is essentially that of an ordinary abdominal section. The patient should immediately receive a hypodermic injection of $\frac{1}{6}$ or $\frac{1}{8}$ grain of morphin, with $\frac{1}{150}$ grain of atropin. A close watch must be kept over the gauze drainage if the uterus be left *in situ*, or over the glass tube if this be employed. Stimulants in suitable amounts are indicated, and the usual dietetic precautions must be adopted. Should the patient recover and subsequently become impregnated, the induction of premature labor at

the eighth month is strongly recommended by some obstetricians to avoid the possibility of a spontaneous rupture of the uterus.

Rupture of the uterus during pregnancy or the puerperium must always be treated by abdominal section. In the puerperal variety extirpation of the uterus is generally required; the mortality of such cases is almost absolute.

Laceration of the Cervix.—Some degree of laceration of the cervix uteri occurs in almost every labor, and invariably in the case of primiparæ. By this statement is meant that the external os uteri no longer retains its original form: it is lacerated bilaterally to a certain extent, and this laceration constitutes one of the signs of a previous labor. In many cases this normal laceration becomes exaggerated, and the condition is then recognized as *laceration of the cervix.* Most commonly such a tear occurs in the anterior median line, as may be demonstrated by a routine examination of the cervix immediately after parturition. The lips of the rent in these cases are not exposed to outward tension, and, in consequence, by the close of the puerperium union has occurred and the condition commonly escapes observation. The most common clinical variety of cervical laceration is that extending to one or the other side of the cervix (*unilateral laceration*) or that involving both sides (*bilateral laceration*). Not infrequently there occurs a partial yielding of the tissues on each side without entire division through the vaginal mucosa: the os in these cases is quite patulous, but there is no eversion of the lips, as in the case of complete bilateral laceration. This condition is known as an *incomplete cervical laceration*, or more commonly as "*a patulous cervix.*" On the contrary, the tear may be very extensive to one side, and include not only the external os, but extend from the internal os through the cervical tissues, including the vaginal junction. This condition has been termed by Pryor *extraperitoneal rupture of the uterus.* Again,

there may occur three or more radiating tears dividing the cervix into sections, and this is termed *a stellate* laceration of the cervix. Finally, the entire portio vaginalis may be torn away and extruded in front of the fetal presentation. Cervical lacerations seldom fall into the hands of the obstetrician for repair. It is only when the laceration is extensive enough to involve the circular artery or one of its branches, thereby inducing active hemorrhage, that immediate treatment becomes necessary. One or two sutures of silkworm-gut may then be passed and the hemorrhage controlled, after which a vaginal douche should be given and a strip of iodoform-gauze inserted into the vagina and retained there for twenty-four hours. Generally the tear is allowed to remain until some date subsequent to the puerperium, at which time a secondary trachelorrhaphy is performed. The primary operation upon the cervix has not been followed by the best results, and has fallen into disrepute.

Laceration of the Vagina.—The vagina may be ruptured in either its upper or its lower extent. The more serious consequences follow rupture of the upper vaginal region, and this in its etiology and symptomatology closely simulates rupture of the uterus. In certain cases of obstructed labor, notably those associated with neglected trunk presentations, the firm contraction in the upper uterine segment, together with the upward traction exerted by the longitudinal bands of muscular tissue, not only carry upward the lower segment of the uterus, but also cause the dilated cervix to retract above the impacted shoulder. The main strain consequently falls upon the vagina, which is thinned to an alarming degree and may eventually rupture. Again, in certain cases of pendulous abdomen associated with varying degrees of pelvic contraction, rupture of the distended posterior vaginal wall is not uncommon. Extensive laceration of the cervix may be continued through the vaginal walls and even open into the cavity above. In difficult

high forceps operations enormous tears of the vaginal walls may be produced, extending from the cervix to the vulvar orifice and involving not only the mucosa but the deeper tissues. Large vessels have thus been ruptured, and even such important organs as the ureters injured. During the puerperium, if there have been a protracted labor with a long-continued pressure of the child's head upon the vaginal walls, extensive sloughing of the devitalized tissues may ensue, with the formation of vesicovaginal or rectovaginal fistulæ. Vaginal lacerations, it will be noticed, therefore, may occur spontaneously from overstretching of the parts: they may, and most commonly do, result from instrumental interference, or after labor from sloughing of the devitalized tissue. The most common seat of vaginal tears due to stretching is the upper posterior wall, while sloughs are more common upon the anterior wall, and instrumental lacerations occur either posteriorly or anteriorly. The only symptom of vaginal laceration is hemorrhage, which may be profuse, but is rarely excessive. The remote consequences of such an accident are of more serious import. More or less vaginal subinvolution will follow, the puerperium will be protracted, the lochia increased in amount and altered in quality and appearance, and the woman exposed to greater risks of sepsis. The proper course of treatment is immediate suture of the laceration under antiseptic precautions, followed by the introduction of a vaginal suppository of iodoform (25–30 gr.), and a daily douche of a 2 per cent. solution of creolin. If sloughing occur to a limited degree, the resulting fistula may be healed by daily applications of silver nitrate or nitric acid to favor granulation. Larger fistulæ must be closed by some appropriate plastic operation.

Laceration of the vulva is occasionally noted. It is exceptional for the fourchet to escape intact in a first labor, and not infrequently the tear becomes a true perineal laceration. In difficult instrumental labor more or less serious

lesions of the nymphæ, and even tears and erosions involving the labia majora, are by no means rare. These lacerations must be repaired at once, if of any extent, one or more silkworm-gut sutures being inserted. Contusions and minor lacerations of the vulva require antiseptic washes and the introduction daily of a vaginal suppository of iodoform.

Laceration of the Perineum.—The most common laceration of the birth-canal is that involving the pelvic floor. Perineal lacerations occur in from 25 to 35 per cent. of all primiparæ and in from 3 to 6 per cent. of multiparæ. The *causes* of this accident are excessive rigidity of the tissues, as frequently noted in elderly primiparæ; a small subpubic angle; malpositions and malpresentations of the fetal head; over-size and precipitate delivery of the fetal shoulders and abdomen; the improper use of the obstetric forceps; and extreme friability of the parts, as in grave specific infection, marked obesity, or pathologic cutaneous conditions. Even when these predisposing factors are present, however, careful supervision of the forces of labor will save many a perineum that would otherwise inevitably be lacerated. After every labor it should be the routine duty of the accoucheur to examine closely for perineal lacerations—not only the simple median tears, but those that are more readily overlooked because not involving the cutaneous surface. To discover these the labia must be well separated in a strong light, and a visual, as well as a digital, examination made. The *varieties* of perineal laceration are—1. *Incomplete lacerations*, or simple tears in the median line extending down from the fourchet and dividing the perineal body. These appear as ragged rents varying in depth from a mere scratch to an inch or more, but not involving the sphincter muscle of the bowel. There may be an associated tear of the vaginal mucosa of varying extent. 2. *Lacerations of the vaginal sulci*, one or both. These are tears that, often beginning in a central laceration, but very frequently occurring independently of any external

rupture, extend obliquely upward and outward along the line of junction of the anterior and posterior vaginal walls. They may consist merely in a superficial separation of the mucous and submucous tissues, or there may be an actual division of the fibers of the levator ani muscle, resulting in permanent disability with relaxation of the pelvic floor, whereby the support of the pelvic viscera is impaired and their ultimate prolapse favored. 3. *Complete rupture of the perineum*, a laceration in the median line extending entirely through the perineal body and destroying the continuity of the sphincter ani muscle. Such a tear may begin at the fourchet and extend into the bowel, or in rarer instances the rectovaginal septum may be ruptured high up by a misplaced fetal extremity, and the tissues intervening between this perforation and the anus may be torn through during the delivery of the child. These tears involving the rectum are the most troublesome to the physician and the patient: inducing an absolute incontinence of flatus and feces, they reduce the woman to a most deplorable condition, and if not corrected, absolutely exclude her from social duties and render her an object of aversion not only to her family and friends but also to herself. It seems almost incredible that such a condition should be permitted to exist for weeks, and even for ten to twenty years or more, as has been recorded in some instances. Unlike simple median tears, there is shown but little tendency for such extreme lacerations to heal spontaneously during the puerperium: this results mainly from the contraction of the torn fibers of the sphincter ani muscle, which separates the lips of the wound. Very rarely, however, even under these unpropitious circumstances, a spontaneous cure has followed an expectant course of treatment with appropriate antiseptic washes and close approximation of the knees. 4. *Central perforation of the perineum.* In a certain number of cases, especially in those in which there has not been maintained a perfect flexion of the fetal head, an undue amount of pressure is

brought to bear upon the vaginal wall some distance above the pelvic floor. A rupture occurs at this point, and the fetal head, instead of pursuing the usual curve of the lower parturient canal, is driven forcibly through the perineal body and produces a rupture of the skin-perineum midway between the anal orifice and the fourchet. It is even possible, though extremely rare, for the entire fetus to escape through such an opening without the tear communicating with the vulva above or the rectum below.

Tears of the perineum very seldom produce immediate symptoms. It is only when a vessel is torn that the hemorrhage will call attention to the condition of the parts. Not infrequently the tissues may be seen to yield before the advancing presentation, or they may be felt to tear as the trunk and extremities are driven through the vulvar orifice. *Treatment.*—The most important element in the treatment of perineal lacerations is prophylaxis. A very large proportion of tears may be avoided by skilful management of the forces of labor, as already described (page 166). If, notwithstanding these measures, a laceration result, the proper course is the immediate repair of the injury. Primary perineorrhaphy, if carefully performed, is almost invariably followed by satisfactory results. There exist weighty reasons why the operation should be performed immediately after the injury. In the first place, the edges of the wound are fresh, and no loss of tissue is incurred by denudation; secondly, the patient is saved the inconvenience of a secondary operation and the danger of septic infection during the period of granulation; finally, if the wound be immediately closed and the edges of the muscular fibers coaptated, the perineal floor will not be irretrievably weakened as a consequence of muscular atrophy arising from disuse, as will almost inevitably follow a neglected laceration. *Operation.*—Perineorrhaphy is most satisfactorily performed under anesthesia: a thorough exploration of the parts can then be effected

and the amount of injury accurately ascertained. An antiseptic vaginal douche should be given, and the wound, if not a complete laceration, closed by silkworm-gut or catgut sutures. For the simple median tear all that is required is the passage of one or more deep sutures, including the entire depth of the wound down to the vaginal mucosa, and entering and emerging on the cutaneous surface at equal distances from the perineal raphe on each side; these sutures are tied in the median line. If there be a vaginal laceration extending up the sulcus upon one or both sides and dividing the fibers of the levator ani muscle, vaginal sutures must first be inserted after the manner prescribed in Emmet's operation, and the perineal wound closed as before. The closure of a complete laceration through the sphincter ani muscle is a more difficult procedure. The operation resolves itself into three stages: In the first place, a strong suture of silkworm-gut must be inserted from the skin-perineum to the depth of the wound, and in the plane of the rectovaginal septum, in such a manner as to include within its grasp the torn fibers of the sphincter ani muscle. This suture emerges at a corresponding point upon the opposite side of the perineum. It need not be made taut until after the other sutures are passed. The next step includes the suturing of the rectal and vaginal mucosæ, which are closed by a sufficient number of fine catgut sutures, beginning above at the apex of the rent on the vaginal surface and extending down so as to include the rectal mucosa. Some prefer to close the two mucosæ separately—first the rectal, the sutures being tied within the rectum, and then the vaginal, with the knots lying within the vagina: this method will answer very well in many cases. The rectovaginal septum having been repaired, the sphincter-suture may be drawn taut and the rectal orifice thus firmly closed. There now remains the third stage of the operation—namely, closure of the perineal laceration—which is accomplished by a series of silk-

worm-gut sutures passed in the manner already described. The injury being thus repaired, a thick coating of acetanilid or iodoform is dusted over the wound and a vaginal suppository of iodoform inserted. In the graver tears it will be well to bind the knees together, a towel being placed between, for a few days. The *after-treatment* consists in attention to cleanliness, the opening of the bowels on the third or fourth day, and the administration of daily vaginal douches. The sutures, if of silkworm-gut, must be removed on the seventh or eighth day.

(*b*) *Vaginal and Vulvar Thrombosis* (*Vulvar or Labial Hematoma; Pudendal Hematocele*).—The varicose condition so common in the pelvis, vulva, and vagina during the later weeks of pregnancy may become a condition of considerable menace to the patient. Rupture of one of the dilated vessels may follow at any moment, and especially during the progress of labor. Should this occur externally, a profuse hemorrhage, that may even result fatally, will follow. If rupture take place subcutaneously, there will result an effusion of blood into the cellular tissue. There will thus be formed a *labial*, *vaginal*, or *subperitoneal* (*broad-ligament*) *hematocele*, according to its situation. Curiously enough at first sight, it has been demonstrated that pudendal thrombosis is more common in primiparæ, in whom the varicose condition is rarely so excessive as in multiparæ. This frequency in first labors may be explained as follows: In the first place, the varicosities, not having attained the enormous size that is common in multiparæ, are not so productive of discomfort, and, if entirely vaginal, are not discovered by the patient; consequently, she does not exercise the same care in avoiding injury; secondly, the chronic phlebitis that invariably follows a protracted varicose condition renders an additional support to the dilated veins in subsequent pregnancies by causing an immense hypertrophy of the adventitia of the vessels; hence rupture in these veins cannot so readily occur. Hematocele

of the broad ligament may speedily prove fatal by secondary rupture into the free abdominal cavity. Vulvar hematocele occurs most commonly during labor, and is then generally produced by direct traumatism, either from the pressure exerted by the fetal head or from the use of the forceps. According to Winckel, this complication is encountered but once in 1600 labors. *Symptoms.*—During the height of a paroxysm the woman will suddenly experience an acute lancinating pain in the region of the vulva, quickly followed by intense bearing-down pains at irregular intervals, and associated with symptoms of concealed hemorrhage—collapse, rapid small pulse, coldness of the surface, and vertigo. The pain radiates to the lumbosacral region and down the thigh. Very shortly there follows a swelling of the vulvar tissues that may be slight, or so extensive as to actually constitute an obstruction to the further progress of labor, attaining at times the dimensions of a fetal head at term. This swelling is more or less rounded and circumscribed, is of an intensely dark-blue or purplish appearance, of a firm consistence, not yielding to pressure, and intensely sensitive. Not infrequently a marked vaginal tenesmus is noted. The *diagnosis* is easy. The sudden appearance of the tumor, the intense pain, the signs of collapse, and the irreducible nature and physical signs of the swelling are conclusive. *Prognosis.*—Labial hematoma is a serious accident at the best. While true that immediate death is exceptional, or even unknown if secondary rupture do not occur, the patient is exposed to all the risks of subsequent hemorrhage or septic infection. The prognosis must therefore be guarded. *Treatment.*—1. If the effusion be limited in amount, the child should be delivered as quickly as possible, and with care to avoid external rupture. Extreme care must then be observed to prevent infection of the exuded blood by thorough antiseptic treatment of the parts and the application of suitable substances, as ice-compresses, to favor speedy removal of

the clots. Should suppuration occur, a free incision must be made and the condition treated as an ordinary abscess. 2. In larger effusions in which labor is obstructed it becomes necessary to evacuate the clots and then deliver speedily by forceps. The incision is best made on the external (cutaneous) surface, parallel to the vulvar cleft. After the delivery of the child the wound must be thoroughly cleansed, any bleeding point ligated, and a tampon of iodoform-gauze inserted: this may be held in place by a T-bandage, and must be changed once or twice a day to prevent septic infection. If sepsis occur, the patient must be treated on general principles.

(*c*) *Inversion of the Uterus.*—By this term is meant a turning of the uterus inside out, either completely or in part (Figs. 153, 154). This may appear in two varieties—namely, the *complete* and the *incomplete* or *partial* inversion of the organ. This is an exceedingly rare—undoubtedly the rarest—complication of labor, the statistics of lying-in hospitals giving a frequency of 1 case in 200,000 labors; it occurs most commonly in primiparæ. *Etiology.*—Beckman has collected from literature 100 reported cases of this accident, with a purpose of ascertaining, if possible, its actual cause. In 54 of these cases the condition occurred spontaneously; that is, the fundus of the uterus or that portion occupied as the placental site, while apparently in a condition of paralysis, spontaneously sank in, forming a cup-like depression in the uterine substance; the uterus at once contracted and endeavored to expel this mass, thereby aggravating the condition. In other cases the accident was the result of direct operative interference, as when there had been injudicious traction exerted upon the cord, either when the placenta was partially attached to the fundus or when it was so lodged in the lower uterine segment as to exclude the possibility of the entrance of air. Traction in the latter instance may produce such suction within the uterine cavity that the fundus is drawn down, when the

uterine contractions quickly complete the process. The same effect may be produced in precipitate expulsion of the fetus or delivery of the child while the woman is in the erect position. Again, injudiciously applied efforts at

FIG. 153.—Inversion of the uterus. The lumen of the rectum is seen, and also the inversion funnel, in which are the tubes and an ovary (after J. Veit).

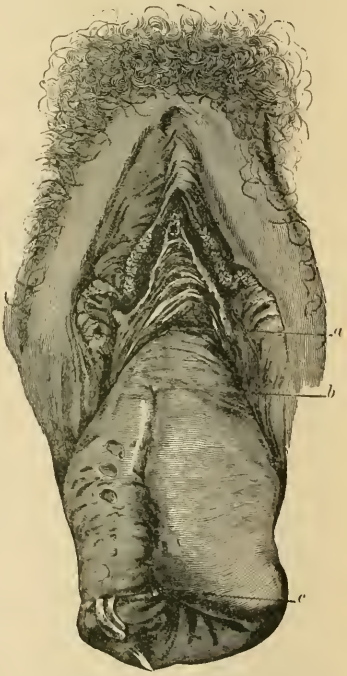

FIG. 154.—Inversion of the uterus, drawn from an old specimen in alcohol. The atonic chief site of placental attachment (*c*) is shrunken by the alcohol, and thus its lessening is explained: *b*, contraction-ring; *a*, external os uteri (after J. Veit).

Credé's or Hoening's methods of expression may force in the fundus uteri. Inversion has even been known to follow violent bearing-down efforts on the part of the woman. The *symptoms* of an acute inversion of the uterus are three —namely, acute pain, hemorrhage, and varying degrees

of shock. The pain may be so severe as to cause the woman to cry out in her agony, and it is probably the most active element in the production of the shock. The hemorrhage may be profuse if the mouths of the uterine sinuses be not closed, or it may be insignificant, adding nothing to the gravity of the case. The pulse is rapid and thready, and the other symptoms of collapse—coldness of the extremities; moist, clammy skin; anxious expression; extreme pallor; nausea and vomiting; syncopal attacks and occasional convulsive seizures—are present. Occasionally, even with symptoms of such gravity as the preceding, the condition has been overlooked, and after a period of serious illness of varying duration there has occurred a slow amelioration of the symptoms and a protracted convalescence. The uterine condition has now passed from the acute to the chronic state: adhesions form between the inverted fundus and the vagina, and a restoration of the parts to their original position becomes impossible. A physical exploration made at the time of the onset of the acute symptoms would prevent any such misapprehension of the condition. There will then be discovered by the abdominal hand a characteristic cup-shaped depression of the fundus in which may be detected the uterine appendages—tubes and ovaries. The vaginal hand will in a complete inversion of the uterus discover a pendulous pear-shaped elastic tumor, lined with the hypertrophied uterine mucosa, emerging from the cervical canal: this tumor will not be present in an incomplete inversion. *Diagnosis.*—An acute inversion should not be confounded with any other condition. It is possible, however, for the inverted organ to be mistaken for a uterine polyp, especially if it remain undiscovered for a day or two. The points of diagnosis between the two are quite distinct. The surface of the polyp will be covered with the normal uterine mucosa, while that of the inverted uterus will consist of decidual tissue and will show the site of placental attachment. The uterine tissue is more

elastic and less fibrous to the feel than is the polyp. It may be that the orifices of the Fallopian tubes can be detected by close inspection of the inverted organ: these would not be present on a polyp. The polyp will be more pedunculated than an inverted uterus; and, finally, the passage of the uterine sound will be conclusive evidence: in the case of a polyp it will penetrate to the normal depth, or more probably for three or more inches, while in the inverted uterus it can be passed but a short distance to the rim of the cervix. *Prognosis.*—Fully 65 per cent. of these women perish within a few hours after the occurrence of the accident. Not only is there the possibility of immediate death from hemorrhage and shock, but, if the condition be overlooked or if the accoucheur be unable to restore the uterus to its normal position, death may follow from sloughing of the organ due to interference with the circulation from cervical constriction, or the woman may perish from septic infection. The prognosis must therefore be guarded. *Treatment.*—As in the case of uterine rupture, prophylactic measures are important. These will consist in guarding against a precipitate expulsion of the fetus, and in avoiding traction upon the cord and the exertion of unnecessary force in the performance of Credé's manipulations. If the inversion occur spontaneously, the active treatment will consist in the immediate reduction of the tumor, followed by efforts to secure firm uterine contractions, whereby a return of the condition will be prevented. Any delay in replacing the fundus will add materially to the difficulty encountered. The steps of the procedure are as follows: 1. Complete anesthetization of the patient. 2. Catheterization of the bladder and evacuation of the rectum. 3. Restoration of the fundus by properly applied taxis. If the inversion be partial, the index and middle fingers passed through the dilated cervix will probably suffice to press the fundus into position, the uterus being steadied by counter-pressure made through the abdominal wall. It may be

that a uterine repositor may answer in such a case if the fingers should fail. In complete inversion more skill is required. The inverted fundus must be grasped in the palm of the right hand while the finger-tips are introduced within the cervix, and efforts at dilatation made while pressure is exerted upon the mass in the direction of the upper parturient canal—upward, forward, and to one or the other side—the organ, as before, being fixed by the left hand applied externally. To accomplish this, the fundus must first be carried bodily backward into the cavity of the sacrum, the promontory of that bone thereby being avoided. If this method should fail, *Noeggerath's maneuver*, progressive reduction of the mass, may succeed. The inverted fundus is grasped between the thumb and index finger of the right hand, and pressure exerted upon it, first upon one side and then upon the other. A partial reduction of the tumor is thus accomplished and its bulk somewhat diminished. Direct pressure is then exerted by the finger-tips upon the center of the tumor in a direction upward and forward, when the fundus will probably slip into position. 4. Reduction having been accomplished, an intra-uterine douche of creolin must be given, and a strip of iodoform-gauze inserted to secure uterine contractions and to prevent a return of the abnormal condition: it is well to administer at this time a hypodermic injection of ergotin. 5. In neglected cases, in which the acute stage has passed and adhesions have formed, it may be that under complete anesthetization, with carefully applied taxis according to one or other of the foregoing methods, the fundus may be replaced. These measures failing, the advisability of complete extirpation of the organ to avoid sepsis or sloughing must be taken into serious consideration.

(*d*) *Diastasis of the Pelvic Joints.*—Among the rarer complications of labor mention must be made of the occasional abnormal separation of the various pelvic synchondroses. In the consideration of the physiology of pregnancy it was

noted that to a certain extent a relaxation of the pelvic joints is normal, this being one of the conservative processes on the part of nature whereby parturition is facilitated. The edema of these structures may, however, become so serious as to constitute a truly pathologic condition, and even a menace to the subsequent comfort and health of the patient. Under these abnormal conditions it may readily be perceived that the excessive distention of the parts necessary to the transit of the fetal head may result in an abnormal separation of one or more of the joints from a yielding or laceration of the ligamentous structures surrounding them. A true dislocation of the pelvic joints may thus be induced. The pubic symphysis, where the greatest amount of relaxation occurs during gestation, is the joint most commonly involved. The sacro-iliac synchondroses may, however, be similarly affected. The *causes* of this accident are excessive relaxation of the ligamentous structures, over-size and extreme rigidity of the fetal skull, undue force exerted in the instrumental delivery of a fetus, or a pathologic fragility of the cartilaginous union of the joints. The *symptoms* are severe pain upon motion; an undue mobility of the parts, whereby efforts at locomotion are impeded or even rendered impossible; and the presence of a sulcus between the edges of the bones. It may be in cases of extreme separation that dangerous laceration of the adjacent soft structures may occur, as rupture of the bladder, vagina, pelvic fascia, or blood-vessels. The only *treatment* is thorough immobilization of the affected joint either by a firmly applied canvas bandage or by a plaster-of-Paris support. The patient must be kept absolutely at rest until the parts be restored to their normal condition. If union do not occur, it may become necessary subsequently to perform some surgical operation, as the suturing or wiring together of the synchondroses.

(*c*) *Fracture of the Pelvic Bones.*—Very rarely, during the violent efforts at traction necessitated by an instrumental

delivery in badly-contracted pelves, some portion of one of the innominate bones may be fractured. This is never pardonable, for in such grave pelvic deformity instrumental deliveries are contraindicated, symphysiotomy, craniotomy, or other major obstetric operation being the proper procedure to adopt. It is possible for a pelvic bone, rendered brittle by rachitis or other abnormal process, without having undergone marked alteration in shape, to yield during a properly conducted instrumental delivery, but such an occurrence is exceedingly rare. In case of fracture the fragments must be properly coaptated and the pelvis immobilized by a closely-fitting plaster-of-Paris jacket.

A variety of fracture that is not of such rare occurrence is that noted in elderly primiparæ at the site of the firmly-ossified sacrococcygeal joint. The head as it descends in the pelvic cavity impinges upon the sharply anteverted coccyx, and, not encountering the normal resiliency, violently drives backward the protruding bone. This accident is followed by that painful condition known as *coccygodynia*, which can be relieved only by total extirpation of the detached bony process.

(*f*) *Subcutaneous Emphysema of the Head and Neck.*— Occasionally, during the violent bearing-down efforts of a labor in which a certain amount of obstruction exists, an alarming condition may develop. There may suddenly ensue an emphysematous condition of the neck, face, and upper thoracic regions, the parts being distended to a remarkable degree and yielding a peculiar and characteristic crackling upon manipulation. This alarming but not dangerous condition results from the rupture of one or more pulmonary alveoli, or of some other portion of the respiratory tract, with an escape of air into the surrounding cellular tissues. Each renewed straining effort drives more air into the tissues, with the remarkable result described. There is but little gravity connected with this accident unless there be associated emphysema of the deeper struc-

tures of the chest and lungs, as the interlobar connective tissue or the subpleural fascia, in which case respiration may be so impeded as to cause extreme dyspnea. The patient and her friends, however, will be terribly alarmed by her condition. Under the circumstances the labor should be terminated at once by instruments, and all bearing-down efforts avoided as far as possible. If the cutaneous distention be extreme, it may be relieved by minute punctures with an aseptic needle and gentle massage of the parts. The patient should be kept quiet and instructed to refrain from any violent respiratory efforts.

(*g*) *Rupture of a Blood-vessel; Hemoptysis.*—An alarming accident, and one that may or may not be attended with serious consequences, is the spitting of blood during parturition. This accident may occur in a woman who is the subject of some organic pulmonary or cardiac disease, as tuberculosis or grave mitral lesion, or it may take place in a plethoric woman in perfect health as a result of almost superhuman efforts at expulsion of the fetus, one of the pulmonary vessels yielding. The amount of blood lost may be excessive or only a trace, depending entirely upon the size of the ruptured vessel. When such a symptom appears, labor must be terminated at once by instrumental measures and cardiac and pulmonary sedatives administered. A hypodermic injection of morphin and one of ergotin should be given at once if the hemorrhage be profuse, and the ergot continued in 20- or 30-drop doses while bloody expectoration persists.

(*h*) *Sudden Maternal Death during Parturition.*—No more demoralizing event can be imagined than the sudden decease of a parturient or puerperal woman: it becomes, however, the sad fate of all accoucheurs who have attained a large experience in their chosen avocation to be called upon to witness such a calamity at least once if not more frequently. It may be that in the midst of an extreme uterine paroxysm the woman suddenly falls into a state of

collapse quickly followed by death; or the fetus may have been expelled, and the physician is congratulating himself on the happy conclusion of the labor, when the woman suddenly perishes without any appreciable cause. Such an event may result from a number of conditions, as has been demonstrated by postmortem examinations of these women. Probably the most common causes are the following: 1. Sudden *cardiac syncope*, especially when there preexists a fatty degeneration of the heart, either primary or the result of renal disease, or a myocarditis that may soften the tissues or give rise to numerous pus-foci in the walls of the ventricle, causing spontaneous rupture of the heart. 2. *Acute pulmonary congestion and edema*, the result of cardiac or renal disease. The sudden effusion of blood and serum will so overpower the heart and lungs that the vital powers yield. 3. *Puerperal thrombosis and embolism*, a large clot obstructing the pulmonary artery or a main venous trunk or forming within the right cardiac ventricle. 4. *Air-embolism of the uterine sinuses or other vessels.* This accident most usually follows placenta prævia in which there has been a sudden removal of the placenta; it may occur after a profuse postpartum hemorrhage or during the administration of an intrauterine douche. The associated symptoms are sudden collapse; air-hunger; extreme dyspnea; pallor and clamminess of the surface; nausea and vomiting; rapidity, smallness, and irregularity of the pulse; and early death. 5. *Postpartum hemorrhage*, the uterus relaxing and an immense volume of blood escaping within a minute or two, the patient perishing before relief can be afforded her. 6. *Rupture of the aorta or other large vascular trunk* the seat of an aneurysmal dilatation that has escaped detection. 7. *Rupture of a hematoma*, such as frequently follows a varicose condition of the pampiniform plexus of the broad ligament. 8. *Profound mental emotion.* In a few cases recorded in medical literature, immediately after the birth of the child the woman has suddenly

expired without the existence of any adequate cause as revealed by the postmortem examination. The only possible explanation of such an occurrence is that, owing to the intensity of some mental emotion, as extreme joy, shame, or fear, combined with great physical depression, the maternal vital powers have yielded.

In every instance in which maternal death occurs during the progress of labor instant delivery of the fetus must be accomplished, otherwise it will perish from interference with the fetoplacental circulation. If engagement of the head have taken place, the forceps may be applied and the fetus quickly extracted. If engagement have not occurred, the maternal tissues will be so relaxed that podalic version may be performed with surprising ease and the child delivered. Postmortem Cesarean section may be performed if the accoucheur be so inclined, but the other methods suggested would appear to be the preferable procedures.

V. PATHOLOGY OF THE PUERPERIUM.

When a woman has passed safely through labor with all of its numerous possibilities for evil, as just enumerated, her condition is by no means devoid of danger. The puerperium is as beset with evils *sui generis* as is labor itself. Thus, there may ensue a profuse hemorrhage that may terminate her life with scarcely a moment's warning; septic germs of intense virulence may gain entrance into her system and play havoc with the normal process of involution, or destroy the patient with lightning-like rapidity; there may ensue a profound alteration in the tissue-metabolism, especially in the hematopoietic system, whereby a progressive grave anemia may be developed; the profound depression and shock to the general system that are unavoidable consequences of such a tremendous exertion as that necessitated during the expulsion of a fetus predis-

pose her to the malign influence of extraneous causes by lessening her resisting powers: she is therefore more prone to develop a pneumonia or other concurrent disease during the early days of the puerperium, or to reveal some latent dyscrasia probably heretofore unsuspected; the profound mental strain in association with the extreme physical depression may temporarily, or, indeed, permanently, destroy the equilibrium of the mind, and that deplorable sequence of parturition, puerperal insanity, develop; and, finally, lactation and the mammary development are beset with numerous accidents that may seriously alter the normal process of the puerperium. These and other pathologic conditions may appear during the six weeks of uterine involution, and so modify its course as to either greatly prolong the period of convalescence or abruptly terminate it. In about the natural order of their development these pathologic conditions may be stated as follows:

1. The Hemorrhages of the Puerperium.

Foremost among the grave accidents of this critical period stand uterine and vaginal hemorrhages, which may appear immediately after the termination of labor or not until some days or weeks of the puerperium have elapsed. To that variety occurring at any time during the twenty-four hours after parturition has been given the name of *postpartum hemorrhage*, while any bleeding occurring subsequent to this period and during the six weeks of involution is designated as *puerperal hemorrhage* proper.

1. **Postpartum Hemorrhage** ("**Flooding**").—The probability of the occurrence of this alarming accident should be ever before the mind of the accoucheur: however small his experience, he will invariably sooner or later be called upon to cope with it. It is important, therefore, that the etiology of any given case be promptly recognized in order that the proper course of treatment may be instituted. Postpartum hemorrhage can follow one of two causes: either

there has occurred a *relaxation of the uterus*, whereby the large lacerated uterine sinuses are allowed to gape and throw out an immense volume of blood, or *some portion of the lower birth-canal has been lacerated* to such an extent as to involve a vessel of considerable size, the uterus itself remaining firmly contracted. The most frequent of these conditions is that due to uterine relaxation. If the peculiar nature of the uterine walls at term be taken into consideration, as well as the remarkable changes that have occurred in the vessels and other tissues of the pelvis during gestation, the wonder is that this frightful accident does not occur with even greater frequency than is actually noted. The wonderful conservative processes of nature are alone responsible for the marvellous immunity that the great majority of puerperal women display. These processes are three in number—namely, changes in the vessel-walls, changes in the blood itself, and changes in the uterine muscle-fibers. Probably the most important changes are those involving the walls of the uterine sinuses. The rapidly growing organ demands a corresponding increase in its blood-supply, and in order to accommodate the vastly increased current of blood thrown into the uterus by the uterine and ovarian arteries, and to facilitate its ready return to the circulation, there occurs an immense dilatation of the vessels traversing the substance of the uterine walls and of the return veins in the broad ligaments and pelvic fascia. This dilatation is accomplished at the expense of the vessel-walls themselves, which lose in thickness as the pregnancy advances. Little by little the muscular and external or adventitious coats are absorbed, until at the expiration of the full period of gestation there remains but the delicate intima, closely invested by the network of hypertrophied uterine muscular fibers. The veins are therefore transformed into vast channels or sinuses, having largely lost the normal characteristics of blood-vessels. This loss of substance permits an absolute obliteration of the channels under the in-

fluence of the firm uterine contractions, and this is probably the most important element in the prevention of postpartum hemorrhage. Supplementing this compressibility is the marked elasticity of the intima, as a result of which the edges of the torn sinuses retract into the substance of the uterine muscle, which overlaps and thus mechanically closes the gaping vessel-mouths. The second conservative process is the increased coagulability of the blood during gestation, due to a peculiar hyperinosis. Mention has already been made of this alteration in the constitution of the blood, which, while mainly conservative and beneficial and an essential element in the prophylaxis of postpartum hemorrhage, may constitute an active source of danger under other circumstances shortly to be described. As a direct consequence of the slowing of the blood-current in the dilated sinuses and of the extreme attenuation of the vessel-walls, diapedesis of the white blood-corpuscles readily occurs, and these escaped cells, rapidly proliferating in the connective tissue around the vessels, still further obstruct the lumen, and mechanically prevent an escape of blood from the sinuses at the time of the separation of the decidua. Finally, the third conservative process in the prevention of postpartum hemorrhage consists in the immense physiologic hypertrophy of the individual muscle-fibers of the uterus, which by their conjoined exaggerated action exert such a pressure upon the attenuated vessels as to effectively obliterate their lumina.

Having, thus, a lucid understanding of the normal conditions that should hold, it will more readily be perceived how a postpartum hemorrhage may occur from the so-called relaxation of the uterus. There must necessarily be, in the first place, anything giving rise to a condition of uterine inertia; secondly, anything preventing a proper retraction of the ends of the vessels; and, thirdly, any mechanical cause preventing an absolute contraction of the muscle. Among the causes of uterine inertia may be mentioned—1. *Extreme*

exhaustion, as that induced by oft-repeated childbearing; excessive uterine action in primiparæ; poor hygienic surroundings; malnutrition; overdistention, as from hydramnios or twin pregnancy; grave general disease, as pulmonary tuberculosis, chronic nephritis, or valvular lesion. 2. *Abnormalities in the uterine wall*, as from imperfect development of the uterus or of the individual muscle-fibers; an imperfect or deficient nerve-supply; a nonresponsiveness of the nervous organism, as in so-called uterine apathy. 3. *Temporary paralysis of the uterine muscle*, as from complete anesthetization; a precipitate labor or rapid delivery of the fetus by version or forceps, the uterine cavity being evacuated so rapidly that the walls have not the proper stimulus to contract; profound mental emotion, resulting in an inhibition of the uterine contractions. Retraction of the ends of the severed vessels will be prevented when there exists an adherence of a portion, however small, of the placental tissue. The partially separated vessels persist as wide, open-mouthed channels that pour out an immense volume of blood as long as the placental adhesions last. Finally, mechanical obstacles to absolute uterine contraction may exist, as when there are retained within the uterine cavity large clots of blood or fragments of the secundines, or when there exists without the uterus or in the substance of its wall some abnormal condition preventing its proper contraction, as the presence of firm bands of adhesion in Douglas's cul-de-sac, or anteriorly between the uterus and the bladder; a largely distended bladder or rectum; the presence of an immense pyosalpinx, hydrosalpinx, pelvic exudate, or ovarian cyst; an ankylosed condition of the muscle-fibers as a result of an extinct metritis; or a large fibroid tumor in the fundus or walls.

A second variety of postpartum hemorrhage is that due to actual traumatism at some point in the lower birth-canal. Most commonly the bleeding comes from an extensive

laceration of the cervix and vaginal vault involving the circular artery, or from the lower anterior vaginal wall near the orifice of the urethra; more rarely, an over-sized perineal artery may be divided and hemorrhage result. Such traumatisms are of rare occurrence at the best, and are generally the result of an injudicious use of the obstetric forceps. They may, however, follow the yielding of cicatrices before the advancing presentation.

The *symptoms* of postpartum hemorrhage, if it be profuse, are those of collapse, together with the presence of the blood, which may be ejected in immense quantities, saturating the bed-clothes and mattress and overflowing upon the floor. In these tremendous bleedings death may follow within a minute or two, preceded by all the manifestations of hemorrhage—extreme pallor; coldness of the extremities; great rapidity, feebleness, and irregularity of the pulse; an anxious expression of the countenance; air-hunger; dimness of vision, with muscæ volitantes; tinnitus aurium; mental confusion; and, finally, a convulsion rapidly terminating in death. In the moderate cases the blood will be seen escaping in gushes or in a constant stream. The *diagnosis* of the condition is plain. The escape of blood from the vulva will be conclusive evidence as to the state of affairs. The only question that will arise is as to whether the bleeding is the outcome of uterine relaxation or whether it comes from some laceration below the cavum uteri. This point is at once determined by placing the hand upon the abdominal surface directly over the uterine fundus. In relaxation of the organ there will be detected a large flabby structure, nonresilient and imperfectly defined through the abdominal tissues. The application of energetic friction over this mass (Credé's method) will excite uterine contractions, and as the organ hardens under this stimulation there will occur a sudden spurt of blood from the vulvar orifice as the fluid contained in the uterine cavity is expelled. This hemorrhage is quite dis-

tinctive as compared with that arising from lacerations of the cervix or vagina. In the latter case the uterus may be found quite firmly contracted, while, notwithstanding this tonic condition, there is a constant flowing or spurting of blood from the vagina. Examination of the vulvar and vaginal regions will then reveal the bleeding point. The *prognosis* of postpartum hemorrhage is doubtful. If the condition be detected at once, it is a simple matter to apply appropriate measures to control the bleeding and prevent further hemorrhage. If assistance be not at hand, or if the medical attendant be a man slow of wit or ignorant of the proper measures to be taken, a fatal termination will quickly ensue. Especially dangerous is that variety of postpartum hemorrhage in which, owing to the formation of a vaginal or cervical clot or the introduction of a vaginal tampon, the hemorrhage is converted from an open into a concealed bleeding. Here it becomes imperative that the accoucheur recognize the diagnostic points between the hard rounded mass of a firmly-contracted uterus and the large flabby body of uterine relaxation.

The *treatment* of postpartum hemorrhage includes, primarily, prophylaxis, and, secondarily, the means to control the active bleeding.

1. The *prophylactic treatment* has already been touched upon. In any given case in which one of the predisposing causes of hemorrhage is known to exist, or when there is reason to fear varying degrees of uterine inertia, the most energetic measures should be instituted to avert such a disastrous sequence. Too rapid evacuation of the uterine contents must be prevented, and as the fetus and secundines descend the lower birth-canal gentle pressure above on the fundus uteri through the abdominal walls, either by the disengaged hand or, preferably, by the nurse or other assistant, should maintain the uterine walls in close apposition to the fetal body and other solid contents. A firm degree of uterine contraction may thus be maintained and

the possibility of relaxation prevented. It is well, in doubtful cases, when the head is born, to administer a dram or two of the fluid extract of ergot by the mouth, or, if the patient be under the influence of an anesthetic, to inject into the thigh a syringeful or more of ergotin. Immediately after the removal, by Credé's manipulations, of the secundines and whatever clots may be contained in the parturient canal, a vaginal douche of creolin may be given and a firm abdominal binder with a uterine pad applied: these maintain a constant pressure upon the sensitive uterus and thereby excite it to continuous tonic contraction. Excessive moving of the patient from one side of the bed to the other, or any mental disturbance, must be avoided. In instrumental labors the greatest care must be observed to avoid undue damage to the soft structures.

2. *Curative Treatment.*—As soon as the hemorrhage is discovered the fundus of the uterus must be grasped and the kneading movements of Credé instituted, while with the disengaged hand the uterine cavity is explored for fragments of placental tissue or membranes or for clots: these must be evacuated, the hand not being removed until expelled by strong uterine contractions. The uterus firmly contracted, repeated hypodermic injections of ergotin must be given and the pad and binder firmly applied as before. In the vast majority of cases such a course of treatment will control the hemorrhage. Occasionally one of the trying cases of uterine inertia or apathy will be encountered, and it then becomes imperative to resort to other methods of treatment. The experience of most obstetricians is that in any case in which Credé's manipulations fail, the immediate resort to *Duhrssen's method*—thorough tamponade of the uterine cavity with iodoform-gauze—will most quickly and at the same time effectively control the bleeding. The gauze should be in readiness, cut in long strips an inch or two in width: it must be carried to the fundus, which is supported by pressure exerted by the abdominal hand, and packed

firmly in until the uterine cavity will not contain more. Great care must be observed during this procedure not to cause such distention of the vagina and cervix as to give entrance to a large amount of air: fatal air-embolism may thus be induced. The uterus being plugged, a vaginal tampon may be inserted and the woman allowed to rest. The gauze may be removed at the expiration of from six to eight hours, and, if the bleeding be under absolute control, a creolin douche administered and the woman treated as an ordinary puerperal patient.

If iodoform-gauze be objected to, other measures to control the hemorrhage must be employed, as follows: (1) *Various applications to the uterine cavity*, foremost among which may be mentioned *injections of hot water*, which is always available and at the same time antiseptic. The temperature of the water should be high, at least 110° to 120° F., and the quantity injected not less than one or two pints. Simple hot water may be used for the purpose, or a weak solution of mercuric chlorid (1 : 5000). If firm uterine contractions do not follow within from fifteen to thirty seconds, the other extreme may be adopted, and *injections of ice-water* be given or a lump of ice be carried bodily into the uterine cavity. This method is objectionable, because of the chilling of the patient and the difficulty of securing the ice. Probably a more useful method, although one attended with more suffering to the patient, is the employment of *vinegar* as a styptic. A piece of gauze may be saturated with the fluid, carried to the fundus, and there squeezed dry: when the vinegar comes into contact with the sensitive uterine tissue, there occurs an immediate contraction that will expel the hand and all other uterine contents. (2) If these measures fail and a faradic battery be at hand, very effective uterine contractions may be obtained by introducing one of the electrodes to the fundus of the uterus, the other, in the form of a large flat electrode, being applied to the external abdominal wall over the site of the fundus. If desired, the two electrodes may

be used externally, one being placed upon each side of the fundus uteri. (3) If this fails or a battery cannot be obtained, *Herman's method of continual manual compression* (Fig. 155) may be attempted. This is accomplished by inserting the entire left hand into the vagina, forcing the cervix backward, so that the anterior uterine wall rests upon the upturned palmar surface of the fist. The right hand then grasps the strongly anteverted fundus through the abdominal wall and presses it firmly down upon the vaginal hand, so that the uterine circulation is completely controlled and any clots that may be contained within the cavity of the uterus are forced out through the cervical canal. An excessive amount of force is not required, and the pressure may be maintained until thrombi have formed in the uterine sinuses, as shown by absence of bleeding when the abdominal hand is relaxed.

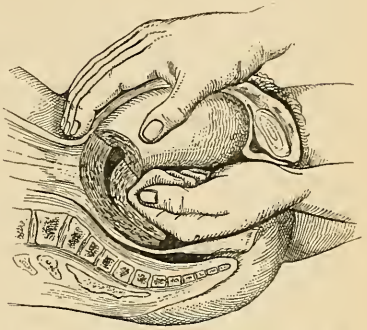

FIG. 155.—Herman's method of controlling postpartum hemorrhage.

Other methods of direct manual compression of the uterus have been suggested. That employed by Zweifel consists in strongly anteflexing the uterus, the cervix being pressed upward by the vaginal hand against the fundus uteri, which is depressed by the abdominal hand. This method has the disadvantage of preventing the escape of any clots that may be retained in the uterine cavity, thereby preventing the recurrence of firm uterine contraction. Another unsatisfactory method consists in a retroversion of the uterus by the external hand, which compresses the organ against the rounded prominence of the vertebral column. Still another, equally unsatisfactory, consists in carrying the vaginal hand far up into the posterior fornix, whence firm ante-

rior pressure is made, the fundus thus being compressed against the symphysis pubis. By far the best method is that of Herman, as just described. (4) *Compression of the aorta* may be accomplished by sinking the fingers into the abdominal surface just above the level of the fundus uteri. The direct compression of the uterus is much to be preferred. (5) *The intrauterine injection of styptic drugs* is a method that is mentioned but to be condemned. The drug most commonly used for the purpose is Monsel's solution, although the solution of the perchlorid of iron and tincture of iodin have been employed. Monsel's solution is used in about 25 per cent. strength, the perchlorid of iron in 16 or 17 per cent., and the tincture of iodin in 50 per cent. strength. The main objection to the use of these drugs is the formation of dense coagula, which by their presence prevent firm uterine contraction, which may become the seat of septic processes, or from which emboli may become detached and cause the death of the patient. Again, there exists the possibility of the escape of a small portion of the styptic fluid into the free peritoneal cavity through a dilated Fallopian tube, with resultant fatal peritonitis; or the mere injection of such an irritant fluid may give rise to considerable shock and thus precipitate death.

3. The treatment of that variety of postpartum hemorrhage consequent upon lacerations of the lower birth-canal is generally a very simple matter. Immediately upon ascertaining that the body of the uterus is in a state of tonic contraction, a firm vaginal tampon of iodoform-gauze should be inserted until the patient can be prepared for a thorough examination of the vaginal tract and the necessary assistance can be secured. The patient should then be placed in the lithotomy position—if need be, under the influence of an anesthetic—and the gauze slowly removed, a close watch being kept upon the vaginal walls in order to detect the site of the hemorrhage. If a laceration be found to exist upon the anterior wall, a running suture

of catgut should be inserted from below upward, each stitch being taken as a portion of the gauze is removed, until the spurting point is reached, when a final stitch will control the bleeding vessel. If the hemorrhage come from a laceration of the circular artery of the cervix, it may likewise be controlled by one or two properly inserted sutures. It may become necessary to employ a Sims speculum to facilitate this operation.

4. *The after-treatment of postpartum hemorrhage* is essentially the same as that already described for acute anemia. The patient's head must be kept low and her feet elevated. Hypodermic injections of cardiac and respiratory stimulants, as strychnin, ether, digitalis, or strophanthin, are essential. Hot applications to the feet and limbs and autotransfusion may be of service. In very grave cases hypodermoklysis of normal saline solution or the intravenous injection—into the median cephalic vein—of this fluid may be employed. In performing the latter operation extreme care must be observed not to allow the entrance of air into the veins. It is very essential that the patient be kept absolutely at rest to avoid sudden cardiac syncope, the displacement of the thrombi, or the production of thrombosis and embolism elsewhere, to which accident women are especially prone subsequently to a postpartum hemorrhage. Alimentation should consist of teaspoonful doses of brandy or whisky and hot water or coffee, repeated at quarter-hour intervals until the patient have rallied sufficiently to assimilate stronger food, as small amounts of the freshly expressed juice of beef, beef-tea, or mutton-broth. If the stomach prove rebellious, rectal alimentation should be resorted to, the nutritious enemata consisting of whisky, small amounts of pancreatized milk, or the yolk of an egg and hot water.

2. **Puerperal Hemorrhage Proper, or Secondary Postpartum Hemorrhage.**—By these terms is indicated a hemorrhage from the parturient canal occurring at any time during the puerperal period subsequent to the first twenty-

four hours. This accident is not of nearly so frequent occurrence as is true postpartum hemorrhage. When it does occur, it generally indicates the retention within the uterine cavity of some portion of the placenta or membranes, that has just become detached, thereby opening one or more of the uterine sinuses. Under these circumstances the uterus will be found much heavier than normal, and the hemorrhage will probably have been preceded for some time by a more or less fetid lochia or by an increased quantity of a too sanguineous discharge. The hemorrhage will occur suddenly, and often in profuse amount, almost exsanguinating the patient. A second rather frequent cause of puerperal hemorrhage is a displacement of the thrombi that block up the uterine sinuses, occurring as a result of a sudden exertion on the part of the patient, as on sitting up or turning in bed or straining at stool, or more rarely due to a septic decomposition of the clot in that peculiar and serious form of puerperal sepsis, uterine phlebitis. The hemorrhage in this case is very profuse, appears without any previous warning, and may be extremely difficult to control. Relaxation of the uterus either as a result of retained matter in the cavum uteri or from lack of nervous inhibition, as when the patient is the subject of profound mental emotion (extreme fright or grief), may induce alarming or even fatal hemorrhage. Again, displacements of the heavy puerperal uterus by a distended bladder or rectum or from pathologic conditions may, by maintaining an undue engorgement of the organ and thereby preventing the proper involution, be productive of profuse irregular hemorrhages. The same result may follow an early getting up or any other cause tending to subinvolution, as the presence of uterine tumors (fibromata, mucous polypi, and cervical carcinomata); intense pelvic congestion, as when there exists a varicose condition of the pampiniform plexus of veins, or ovarian or tubal disease; or some disease, as a mitral valvular lesion, productive of a general

venous engorgement. There is nothing distinctive in the hemorrhages attendant upon these conditions. The *treatment* will vary with the cause. If there be a retention of placental débris or an hypertrophied and congested decidua, the uterine curet must be employed and all extraneous matter removed. A displaced uterus must be replaced and the bladder and rectum kept empty. In simple uterine relaxation or that due to emotion the uterine cavity should be packed with a strip of iodoform-gauze: this is also necessary in the case of a septic hemorrhage and in one due to displaced thrombi from any cause. In this latter variety the use of the curet must be rigorously prohibited. Profuse hemorrhage arising from the presence of uterine fibromata may likewise necessitate a thorough uterine tamponade, while internally may be administered remedies conducive to the absorption of the neoplasms, as ergot, ammonium chlorid, strychnin, and quinin. A judiciously applied course of faradism may be of some service in these cases. Mucous polypi may be snared off or removed by the curet. The *after-treatment* is that required subsequently to a postpartum hemorrhage.

2. Puerperal Thrombosis and Embolism.

By this term is meant the sudden clotting of the blood in one of the venous trunks, whereby the circulation is impeded and serious consequences result, or more commonly instant death. Puerperal women are especially prone to this accident from the extreme hyperinosis that characterizes the gravid state. There also exists with this increased coagulability of the blood a sluggish circulation, and all that is required to produce an actual thrombosis at any point is some form of mechanical obstruction. This may be furnished by a small clot displaced in one of the immense uterine sinuses, which, being carried into the general circulation, lodges at some convenient site. From the resulting thrombus small emboli are broken off, and these,

lodging in the brain, heart, or lungs, rapidly induce death. The most common period for a puerperal thrombosis to develop is shortly after a profuse postpartum hemorrhage, at which time there exists a still greater tendency to coagulation of the blood because of the decreased tension of the blood-current. Emboli are most common in the pulmonary artery and in the cavities of the right side of the heart, and may consist of solid particles of coagulated blood, particles of fat, or bubbles of air, the latter being noted in certain cases of placenta prævia in which there has occurred a rush of air into the uterine cavity. The *symptoms* of puerperal thrombosis are abrupt and startling. Without warning there suddenly occurs a most intense dyspnea, with violent efforts at respiration and marked air-hunger. The patient manifests all the symptoms of one in the extremity of suffocation. She tears at her throat and chest; her eyes strongly protrude; she endeavors to rise from her bed; her face and general surface become deeply cyanosed or, more rarely, extremely pale; the skin is cold and clammy; there is a violent action of the normal and auxiliary muscles of respiration; the heart's action is rapid, tumultuous, and irregular; the pulse rapidly becomes small and feeble, or is altogether imperceptible; there is a consciousness of impending death; and an epileptiform seizure may promptly end the scene. In a few reported cases there has occurred a gradual amelioration of this frightful group of symptoms, with ultimate recovery of the patient as the clot is removed by a slow process of absorption. The *diagnosis* of puerperal thrombosis is patent. There is no possible condition with which such a grave train of symptoms can be confounded. The *prognosis* is extremely grave. Most of the women die before any attempt at medical relief can be made. The cause of death is probably asphyxia, although this is disputed, some authorities claiming that death results from cerebral anemia, and others from cardiac syncope. *Treatment.*—The attack is so

fulgurant and the fatal termination so abrupt that but little treatment can be attempted. In the few cases in which death does not rapidly supervene, cardiac and respiratory stimulants must be administered in full doses. These will include whisky, camphor, ether, and strychnin subcutaneously, and brandy and aromatic spirits of ammonia internally. Pulmonary congestion may be relieved by local bleeding by cups or leeches, and by the use of revulsives, as hot foot-baths and cataplasms to the calves. Absolute rest and quiet are essential to prevent further dislodgement of emboli and increased dyspnea from exertion. The diet must be absolutely liquid, and mainly milk, although broths and meat-juices may be administered. Inhalations of oxygen may be of service.

3. Puerperal Anemia.

The condition of the blood throughout pregnancy is that of marked hydremia: there is an excess of the watery constituents with an overdistention of the vascular system. After the delivery of the child this unusual condition of the blood is gradually corrected, so that before the termination of uterine involution the blood will have attained its normal state. It occasionally happens, however, that there occurs a failure of this process of hemic involution, the blood retaining its watery quality and the woman presenting a condition of marked anemia. Just what are the causes of such a development cannot be definitely stated. There may be a preexistent dyscrasia or a latent grave systemic disorder, as pulmonary tuberculosis or carcinoma. It may be that the woman's recuperative powers are poor, and the strain consequent upon lactation and the normal puerperal discharges are too great for her to sustain. In some cases the condition originates in an acute anemia engendered by a profuse intrapartum or postpartum hemorrhage, or from some concomitant disease. Whatever the origin, the woman's appearance will plainly indicate the trouble.

There will be an unusual intensity of pallor; the usual degree of strength will be but slowly regained, or it may be there will be a progressive failure of strength manifested by an inclination to abstain from any exertion. She will be compelled to seek her couch more frequently than usual; intense backache and neuralgia will be present; the appetite will be capricious and often poor; she will complain of giddiness and incapacity for cerebration; and later there may be manifested a tendency to hemorrhages, usually small, from the various mucosæ. The *diagnosis* of the condition is plain. The *prognosis* is doubtful, for it will be impossible to say to what extent the anemia may progress. A true pernicious anemia may result fatally if the disease be not speedily corrected. Fortunately, the condition is generally amenable to appropriate *treatment*, which will consist in rigid enforcement of the rules of hygiene; in the taking of a rich and nutritious but carefully selected diet; if need be, in the early weaning of the child and the drying of the breasts to remove the strain of lactation; in a suitable change of scene and locality; and in appropriate mental diversion. Courses of ergot and tincture of nux vomica, in doses of from 5 to 20 minims each, three times daily, may favor uterine involution and thereby diminish the excessive lochial discharge. The hemic condition may be alleviated by the administration of iron in some easily assimilated form, as a solution of the albuminate in 5- or 10-grain doses, the peptomanganate solution in dram doses, or a Blaud's pill three or four times daily. This drug may be supplemented by arsenic in suitable doses. As the condition improves the remedies may be decreased in amount, and the diet altered and increased as the stomach can bear it. Plenty of fresh air is essential.

4. Puerperal Sepsis (Sepsis Puerperalis).

By *puerperal sepsis*, *puerperal septicemia*, *septicopyemia*, *metria*, or *childbed fever* is meant that serious complexus of symptoms arising from the introduction into the system of

the puerperal woman of septic germs and their ptomains, and consisting in great alterations in the temperature and pulse-rate, in profound physical depression, and in marked local (vulvar, vaginal, and pelvic) manifestations. Knowledge of this grave disease has been marvellously developed within the past few years, largely owing to the wonderful progress made in bacteriology and pathology, and we are in a position to-day to offer a more thorough classification of its various clinical phases than would have been possible less than a decade ago. As has been concisely pointed out by Ernst of Boston, in order for the development of the disease there is required, in the first place, a specific virus; secondly, a means of entrance for this virus into the system; and, thirdly, a certain constitutional condition that will favor the development of the disease, the other two factors being present. The specific virus may be any one of a large number of pathogenic microbes that have from time to time been discovered in the various puerperal patients examined: very probably, however, it is the streptococcus pyogenes (Fehleisen's diplococcus of erysipelas) that is the most frequent causal organism. The investigations of Krönig, Williams, Chase, and others would seem to demonstrate the truth of this statement. Other micrococci and bacilli may likewise prove effective in the production of puerperal sepsis of minor degree, and chief among these may be mentioned the staphylococcus pyogenes aureus—a variety present in ordinary fevers—the staphylococcus pyogenes albus, the staphylococcus pyogenes citreus, the bacillus pyocyaneus, the bacillus pyogenes fœtidus, together with a vast number of others. Whatever the variety of microorganism concerned in the origination of the disease, in order to become pathogenically active it must either have lain dormant in the genital canal for some time prior to parturition or it must be introduced therein during or shortly after labor. An entrance into this region once effected, further encroachment upon the organism is facili-

tated by the numerous abrasions and lacerations present after every labor, however normal. It must be borne in mind that a mere mucosal abrasion is fully as dangerous as is a more extensive destruction of tissue. The individual susceptibility of the patient to the action of the specific virus is a variable factor dependent upon the original vitality of the woman. Throughout the entire gestation there is a progressively increasing drain upon her powers: with reduced vitality she enters upon the stages of, it may be, a tedious and often exceedingly difficult parturition; and to the additional strain thus placed upon her may be superimposed an intrapartum or postpartum hemorrhage, whereby her defensive powers are still further broken down. Under these unfavorable circumstances the introduction into the vaginal tract of a germ that might otherwise be successfully combated will probably be followed by the most disastrous results. Then, again, the virulence of the germs seems to be increased in proportion to the suitable condition of their environment, or, as has been pointed out by Waterhouse, Klein, Lachowicz, and others, the effects produced by bacteria are influenced by the media in which they rest. The factors that would seem to favor the development of puerperal sepsis in any case may be stated as follows: a greatly reduced vitality; the presence of numerous abrasions and lacerations in the parturient canal, whereby a ready entrance is afforded the pathogenic microbes; and the extreme difficulty that will be experienced in preserving a proper degree of cleanliness owing to the anatomic peculiarities of the parts. It may be clearly seen, therefore, that even after the most rigid observance of the laws of asepsis and antisepsis, patients in whom this unfortunate combination of circumstances exists may unexpectedly develop the disease and perish.

As to the mode of action of the streptococcus pyogenes, which may be regarded as the type of septic germ most concerned in the production of the disease, much has been conjec-

tured, though but little is known. Doléris has recently suggested[1] that its pathogenic action may be—1. Hypertoxis, by its toxins, and limited to the first stage of the inflammation; 2. Destruction of vitality and a cause of necrobiosis *en masse* of the tissues; 3. Pyogenesis or sepsis at the same time. It is probable that the great malignancy manifested by the streptococci is largely dependent upon their enormous power of propagation, rather than upon any special inherited virulence on the part of the germs. Be this as it may, it is certain that by their presence the following changes in the woman's organism are effected: In the first place, there occurs an enormous propagation of the germs implanted within the parturient tract: these give rise to the formation of very deadly substances known as ptomains, that are readily absorbed by the vessels and lymphatics of the region and quickly enter the general circulation. There then ensue grave alterations in the constitution of the blood and the vital fluids of the body. Varying degrees of hydremia and of leukocytosis may be noted, and, finally, vast numbers of the germs themselves and large quantities of their poisonous products may be detected in the blood and body-serum. An offensive odor emanates from the blood of patients who have died from this disease: the fluid is of a dark color and is deficient in red corpuscles. Ecchymoses in various organs are also found. Locally, there are frequently produced very marked alterations in the tissues of the genitalia. An inflammatory process of greater or lesser intensity may be noted: this may consist merely in an engorgement of the parts, with catarrhal manifestations; there may occur a marked diapedesis, with exudates of varying degrees of consistence; or there may be produced such a devitalization of the tissues as to result in necrobiosis or even absolute gangrenous changes with the formation of extensive sloughs. *Varieties.*—According to the amount of ptomain-intoxication, the method of intro-

[1] *Nouvelles Archives d'Obstétrique et de Gynécologie*, No. 3, 1894.

duction of the virus into the system, and the pathologic changes and clinical manifestations produced thereby, will depend the variety of the septic infection. It has only been of recent years that any classification of the various forms of puerperal sepsis has been attempted. The grouping of Spiegelberg and, more recently, that of Kehrer are probably the best that have as yet been offered, but both of these are largely defective, in that they fail to include the rarer manifestations of the disease and give no clue to their pathologic basis. In the preparation of the following table, which is founded on a combined clinical and pathologic basis, an effort has been made to give a rational presentation of the various aspects of the disease, including not only the more familiar but the rarer forms as well. Clinically, the disease is encountered in two main varieties—namely, that due to infection from without—the heterogenetic form—and that arising from self-infection—the autogenetic variety—which is exceedingly rare. Heterogenetic puerperal sepsis is divided into two classes—namely, that in which there has occurred a general systemic infection, and that in which the general infection is subordinate to the local manifestations. Under these main divisions the various forms of the disease are grouped according to their pathologic features.

A. Heterogenetic Puerperal Sepsis.

Class I. Those cases in which general sepsis predominates:

1. *Hemic or vascular infection.*
   (1) Puerperal septicemia.
   (2) Puerperal phlebitis (*infectious phlebitis; septicæmia venosa*), with thrombosis (*thrombophlebitis*) and embolism (*puerperal embolism*).
      a. Uterine and parauterine phlebitis (*phlebitis uterina; puerperal metrophlebitis*).
      b. Puerperal pyemia (*septicopyemia; pyæmia metastatica; pyæmia multiplex*).
      c. Puerperal (septic) pneumonia.
      d. Puerperal (septic) ulcerative endocarditis.
      e. Puerperal rheumatism; puerperal (*septic*) arthritis.
      f. Femoral (crural) phlebitis (*phlegmasia alba dolens*).
   (3) Puerperal (infectious) erythema (*scarlatiniform erythema*).
   (4) Puerperal (septic) infectious pemphigus.
   (5) Puerperal tetanus (*tetanus puerperarum*).
   (6) Puerperal neuritis.

Class II. Those cases in which the sepsis is mainly *localized* in or around the uterus and its adnexa:

1. Lymphatic infection (*septicæmia lymphatica*; *puerperal lymphangitis*).

(1) Puerperal metritis.
a. Phlegmonous (*metritis purulenta*).
b. Gangrenous (*metritis gangrænosa*).
(2) Puerperal pelvic cellulitis (*puerperal parametritis; puerperal perimetritis; puerperal ovaritis*).
(3) Puerperal peritonitis, pelvic or general (*peritonitis puerperalis*).
2. Involvement of the genital mucosæ.
(1) Vulvitis.
a. Catarrhal or suppurative (*vulvitis catarrhalis*).
b. Phlegmonous or ulcerative (*vulvitis purulenta*).
c. Gangrenous (*vulvitis gangrænosa*).
d. Diphtheric (*vulvitis diphtheritica*).
(2) Endokolpitis.
a. Catarrhal or suppurative (*endocolpitis catarrhalis*).
b. Phlegmonous or ulcerative (*endocolpitis purulenta*).
c. Gangrenous (*endocolpitis gangrænosa*).
d. Diphtheric (*endocolpitis diphtheritica*).
(3) Endometritis.
a. Catarrhal or suppurative (*endometritis catarrhalis*).
b. Phlegmonous or ulcerative (*endometritis purulenta*).
c. Gangrenous (*endometritis gangrænosa*).
d. Diphtheric (*endometritis diphtheritica*).
(4) Endosalpingitis.
Phlegmonous or ulcerative (*endosalpingitis purulenta; puerperal* or *septic pyosalpingitis*).
3. Puerperal (septic) urethritis, cystitis, ureteritis, and pyelitis.
4. Puerperal (septic) proctitis.
B. Autogenetic Puerperal Sepsis.—Autoinfection.

DESCRIPTION OF THE VARIETIES.

A. *Class I. General heterogenetic puerperal sepsis*, in which there is mainly an involvement of the vascular system of the body.

1. Hemic or Vascular Infection.—Here are grouped those forms of the disease in which the poison enters the general system through the medium of the blood and the blood-vessels, including the most common clinical variety—puerperal septicemia—the grave form of puerperal phlebitis with associated thrombosis and embolism, and the rarer manifestations of puerperal rheumatism and arthritis, puerperal or infective erythema, puerperal tetanus, and puerperal neuritis.

(1) **Puerperal Septicemia.**—*Synonyms:* Sapremia (Duncan); Resorptive fever; Ptomainemia; Ptomain-poisoning; Ptomain-intoxication; Septic intoxication; Septic fever; Putrid infection; Putrid intoxication.

Puerperal septicemia is that very common, and generally

rather favorable, manifestation of puerperal fever due to the absorption into the uterine sinuses and other veins of the genital organs, and from thence into the general circulation, of the products of decomposition, the ptomains. These ptomains are produced by the action of the germs of putrefaction upon retained fragments of placenta or membranes, clots, and the lochial discharge. The method of introduction of the germs varies. They may be carried into the cavum uteri by the hands of the physician himself, by uncleanly instruments, by a septic catheter, by carelessness on the part of the nurse, or through the agency of unhygienic surroundings in which the rigid observance of the laws of antisepsis is impossible. Whatever the mode of entrance, a more favorable nidus for the growth and multiplication of these germs cannot be imagined. Within the genital tract they find a suitable condition of heat and moisture and a most nutritious pabulum in the coagulated blood-serum and decomposing fleshy particles. In very short order a vast amount of ptomains is engendered by the process of decomposition and disintegration of the albuminous materials, and it is from the absorption of these materials that the symptoms characteristic of sapremia arise. Once admitted into the general circulation, they induce such a disorganization of the blood—proving especially destructive to the leukocytes—that the resisting-powers of the woman are still further lessened, and the germs themselves then gain admittance to the circulation, where they more rapidly perform their destructive function. According to the amount of hemic intoxication will be the gravity of the symptoms, and, while this form of puerperal sepsis gives the most favorable prognosis and responds most promptly to an appropriate course of treatment, there are nevertheless cases in which the amount of septic absorption is so great and the destructive action so overwhelming that death rapidly ensues. To these fulgurant cases Garrigues has very aptly ascribed the name of *scpticæmia acutissima.*

Symptoms.—(1) *General.*—Sapremia is characterized by a peculiar fever, preceded, as a rule, by one or more initial chills, and quickly becoming intermittent in type or at times markedly remittent. This symptom is not an invariable feature of the disease. In the rapidly fatal cases the depression accompanying the introduction of the virus may be so profound as to throw the woman into a condition of collapse: in these cases it is not exceptional to find an entire absence of fever, or even a subnormal temperature. To a certain extent, however, the degree of hemic intoxication bears a relationship to the temperature-variations, and so constantly is the elevation of temperature noted in the ordinary cases of puerperal sepsis that any rise over 99° F. during the puerperium must lead at once to suspicions of beginning septic changes. The pyrexia most commonly first appears from the third to the fifth day, although in some cases the woman is septic from the time of labor; in other cases there occurs no elevation of temperature until the tenth day or even later. When there is sudden and high elevation, as up to 101° or 102° F., without any warning other than a chill mainly referred to the back and lower extremities, a severe form of the disease may be anticipated, probably of the fulgurant type: generally there occurs a gradual but steady elevation of temperature, each day's record being slightly above that of the preceding day. These progressive elevations indicate successive absorptions of septic matter. Associated with the elevation of temperature there is an extreme rapidity of the pulse, which is much out of proportion to the temperature-rate. Thus with only a moderate degree of fever the patient may have a pulse-rate of 120 to 140 or more beats per minute. This rapidity of the pulse is a much more ominous feature of the disease than is the fever. It is always to be noted, except in the beginning of the rarer cases in which the sepsis originates during or immediately after labor: in these cases, however, the pulse quickly assumes its unusual rate. The

pulse is full and in the minor degrees of sepsis is of but moderate tension; in the more virulent forms it becomes small and exceedingly rapid. There is a rapid respiration-rate, even amounting to 60 per minute. Profound physical depression characterizes every case of sepsis, no matter how mild the degree of intoxication. The depression, like the pulse-rate, is quite out of proportion to the physical manifestations. Headache is invariably present, and is often bitterly complained of. The gastrointestinal symptoms are marked. There is a bad taste in the mouth; the tongue soon becomes thickly furred; the breath is quite offensive; there is more or less epigastric tenderness; the appetite is variable and capricious, or there may be total anorexia; the ingested food may be retained, or occasionally there will be nausea and vomiting; jaundice of but slight intensity may be noted; the bowels usually become loose, and profuse diarrhea is the rule; the stools are frequently light in color, exceedingly offensive, and in the graver cases will be passed involuntarily. The skin is very apt to become leaky, and some patients will be almost constantly bathed in a profuse perspiration. The secretion of the mammary glands may be much diminished, or an absolute agalactia may ensue: this, however, is never noted in the milder cases, and only appears late in the more serious forms of the disease. The lips become parched and chapped, and herpes labialis is sometimes observed. The face presents an anxious cast of countenance, and in some of the graver cases a peculiar duskiness, or even a brownish cast, of the entire surface of the body may be noted. The urine is scanty and febrile in reaction. There is tenderness over the region of the spleen, and careful palpation may detect the enlarged organ.

(2) The *local* manifestations of simple puerperal septicemia are not many, and have special reference to alterations in the lochia and the condition of the uterus. Upon the development of the septic condition the discharge is diminished

in quantity, and may even be entirely suppressed: at the same time its normal appearance and quality undergo a marked change. It loses its peculiar mawkish odor and becomes horribly putrescent and darker in color, at times sanguinolent or purosanguinolent. The odor is not indicative of the presence of dangerous pathogenic germs, although these may be present, but is almost, if not entirely, dependent on the presence in the fluid of immense numbers of the bacteria of decomposition. There may be an entire absence of the lochia or of the putrescent odor, and yet the secretions of the parturient canal may be loaded with streptococci, staphylococci, or diphtheric or other virulent microorganisms, thus proving the utter dissociation of odor with virulency; again, there may be noted, in connection with the lochial discharge, an extremely foul odor which investigation will demonstrate to be entirely dependent upon an uncleanly condition of the external genitals without any coexistent general sepsis. Of much more value than the foregoing in the early diagnosis of puerperal septicemia are the uterine manifestations. These will consist, in the first place, in the development of an undue tenderness on manipulation, especially over the region of the fundus, associated with a certain amount of abdominal distention. By a careful bimanual examination the uterus will be found to be considerably larger than normal, and of a soft and flabby consistence; difficulty may be experienced in clearly defining the outlines of the organ; it is noncontractile, and shows at times complete loss of the muscular tonus; the cervix will be much softer than usual, and the external os quite patulous, so that the index finger can be readily introduced up to or even within the internal os. There may or may not be noted in these simple cases of septicemia a certain amount of tenderness in the region of the broad ligaments.

Diagnosis.—The diagnosis of puerperal septicemia should not be attended with much difficulty. Unfortunately, however, the general physician is so averse to admitting, even

to himself, that he has a case of sepsis upon his hands that he is very prone to argue himself into believing that his patient is suffering from an attack of some other intercurrent disease, as an intermittent or remittent fever or an influenza. It is true that such a noninfectious condition may engender symptoms that closely simulate those of true puerperal sepsis, but it may be excluded by careful attention to the clinical manifestations in any given case. Especially is it of the utmost importance that malarial infection be recognized. The following points may aid in formulating a correct diagnosis between the two diseases:

Puerperal Sepsis.	*Malarial Infection.*
The chills are irregular in their appearance and are associated with marked alterations in the temperature-rate.	The chills occur at regular intervals, and are followed by the usual elevation of temperature and then a sweat.
The constitutional disturbance is profound.	The constitutional depression is moderate, and quite out of proportion to the severity of the paroxysm.
The pulse-rate is exceedingly rapid and ominous.	The pulse-rate is in proportion to the amount of febrile reaction.
There will be associated uterine subinvolution and tenderness, and probably alteration in the lochia.	There will not be noted any peculiar local pelvic manifestations.
The patient's condition steadily grows worse without appropriate treatment.	Within a few hours there will occur a marked amelioration of the symptoms.

Influenza will occasionally be found as a complication of the puerperal state. It may be recognized, however, by the following characteristic features: There will be present the usual pains and soreness over the body, especially in the back and limbs; the local manifestations of puerperal sepsis will not be noted—in fact, involution will probably progress normally—nor will there be such a marked disproportion between the febrile reaction and the pulse-rate as in septic infection; there will be more pronounced gastric and pulmonary disturbances than in septic infection; and, finally, in from four to seven days the disease will have exhausted itself and the patient will return to her normal puerperal condition. It is quite possible, however, for a true puerperal sepsis to develop during an attack of influenza in the lying-in woman.

Other causes of elevation of temperature during the puerperal period are constipation, croupous pneumonia, mastitis, the development of a mammary abscess, tonsillitis, profound mental emotion or shock, reflex gastric and intestinal disturbances, and the rapid development of pulmonary or general tuberculosis. These morbid conditions may be readily recognized by a careful examination of the affected portions and by a history of the case.

Prognosis.—Owing to the utter inability on the part of the medical attendant to definitely state what will be the progress of any given case of puerperal septicemia, the prognosis must remain doubtful. It is true that this is the most favorable form of puerperal sepsis and the most amenable to treatment. A certain proportion of the women, however, will invariably perish either within twenty-four or forty-eight hours or after a few days. The causes of death are profound toxemia and great depression; the development of grave organic lesions throughout the body; asphyxia from great destruction of the red blood-corpuscles; and paralysis of the nerve-centers. The mortality of simple puerperal septicemia may be stated as varying from ½ to 1 per cent.; in the hands of the general profession it will probably reach as high as from 2 to 5 per cent.

Treatment.—1. *Prophylaxis.*—The treatment of puerperal septicemia, as of all forms of puerperal sepsis, should be mainly prophylactic. A very essential element in the prophylaxis of the disease, as pointed out by More Madden, will be the observance of proper sanitation and the maintenance of a good constitutional condition of the patient by a judicious course of hygienic and dietetic treatment, together with the administration of ferruginous tonics throughout the later months of pregnancy. Since the introduction by Semmelweis (in 1846) of antisepsis in obstetric practice the old mortality of 10 to 15 per cent. has been reduced to its present figure. The greatly reduced vitality

of the parturient woman, rendering her more susceptible to microbic invasion, is ample reason for the observance of special precautions to prevent the access of germs to her genital tract. Thorough asepsis of the patient and her surroundings, of the attendants, physicians, and nurse, and of the catheter, instruments, and syringe, must be insisted upon. The employment of sterilized water and suitable germicidal agents, within proper limits, is justifiable, but it must be remembered that overzeal in the prosecution of antisepsis may defeat its own purpose: septic infection has resulted from the use of the vaginal douche itself, and it is now very generally conceded that in normal labor, in women who are perfectly healthy, vaginal douches are unnecessary, and are more harmful than beneficial. In such cases there is more commonly manifested a rapid pulse and an elevation of temperature after, than before, the douching. Only in those cases in which a certain amount of dystocia has occurred or an obstetric operation has been performed are the douches indicated and efficacious. Some men, notably Leopold and Spörlin of Germany, have advocated the conduct of labor without vaginal examination, believing that by such an observance the frequency of puerperal sepsis will be materially lessened. They have suggested a purely external method of examination, with particular manipulations in proper succession (see Figs. 46–49, p. 101), whereby a normal labor may be managed without the introduction of the fingers into the vagina. While this method cannot be generally recommended, it is without doubt proper to limit the number of vaginal examinations as far as is conducive to the safety of the fetus and the maternal structures. Frequent douching also should be limited to those cases in which there already preexists a septic condition of the vaginal tract: in normal cases the general practice is to administer but one douche of creolin or mercuric chlorid, and that immediately after the expulsion of the placenta, in order to remove any clots or fragments of tissue

which, if allowed to remain in the vagina, might undergo decomposition and serve as a nidus for microbic development. It has been demonstrated that a hot vaginal injection of mercuric chlorid, carbolic acid, or other disinfectant, administered during the early stages of labor, has a tendency to contract the vaginal mucosa by constricting the capillaries: it also removes the mucus that normally lubricates the parts, and thereby materially retards the labor by augmenting the friction between the fetal presentation and the vaginal walls. Again, Krönig and Schroeder consider vaginal injections as dangerous, since they may lessen the chemical resistance of the tissues to bacterial action, and may even wash the germs into the uterine cavity. A very convenient cleansing douche for routine practice after labor is one consisting of warm sterilized water containing a small amount of boracic acid or sodium borate, the solution having about the specific gravity of blood (1 part in 25). A 2 per cent. solution of creolin, a solution of carbolic acid (1 : 40), a solution of hydrogen dioxid, or a solution of mercuric chlorid (1 : 2000 or 4000), may be employed in the same manner. The objection to the creolin is its color, which will so disguise the nature of the vaginal discharge as to render it absolutely useless as a means of diagnosis. The mercuric solution has resulted repeatedly in systemic poisoning, and when it is employed the vagina should immediately afterward be flushed with boracic acid or sodium-borate solution. Two substances that have recently been employed as vaginal douches with considerable satisfaction are lysol in a 1 or 1½ per cent. solution, and eucalin (a coal-tar product combined with eucalyptol) in the proportion of 1 to 100 of distilled water. The vaginal douches are best given through the ordinary fountain syringe, to which is attached a glass nozzle with an olive-shaped tipper forated laterally only, thereby still further diminishing the necessary amount of manipulation of the part, and preventing the forcing of the fluid or

of bubbles of air into the uterine sinuses or the Fallopian tubes, with resultant air-embolism or the production of a metroperitonitis. Murray suggests the cleansing of the parts after each micturition by one of the foregoing antiseptic solutions. Firm uterine contraction may be secured, and thereby the formation of intrauterine clots prevented, by the administration, immediately after the delivery of the fetus, of one or two drams of the fluid extract of ergot.

2. *Treatment of the Disease.*—When the disease has actually developed and the woman is manifesting the symptoms of putrid absorption, active interference alone will limit the amount of systemic infection. The indications for treatment are to remove the source of infection, to eliminate the poison already in the system, and to sustain the patient during the period of profound physical depression consequent upon the hemic intoxication. These indications will be met by general and local medication.

(*a*) *Local Treatment.*—By far the more important are the means employed to prevent further absorption of the bacteria and their ptomains. This can be accomplished only by thorough disinfection of the parturient canal. It will not suffice to douche the vagina alone, for Ahlfeld, Jewett, and others have clearly demonstrated that the seat of most active absorption of the toxic material is the placental site, the vagina ranking next in importance. Hence arises the necessity of thorough *intrauterine irrigation and curetment* in all cases of puerperal septicemia. Local asepsis embraces the following steps: 1. *Thorough asepsis of the hands and the instruments to be employed.* This will be secured according to the methods already described in the section on the treatment of labor. The patient must then be placed in the lithotomy position at the side of the bed, with a Kelly pad under her hips and a vessel below to receive the fluid. It is preferable that an anesthetic be given to secure absolute relaxation of the parts and to prevent suffering. 2. *Asepsis of the vulvar orifice.* It is patent that

in any case in which it becomes necessary to resort to uterine cleansing and medication the passageway from the exterior to the internal os must be rendered as aseptic as possible. The vulvar and pubic region, if they be not primarily rendered aseptic, may very readily infect the interior of the vaginal canal by direct transference of the germs during the necessary manipulations. This may be accomplished as nearly as possible by thorough washing of the parts with soap and water and, if need be, the brush, and then with alcohol, after which they may be cleansed with pieces of lint saturated with a mercuric-chlorid solution (1 : 2000). 3. *Asepsis of the vagina.* The vagina must be cleansed by a solution of green soap and water, especial attention being paid to the folds of the mucosa around the ostium, the lateral sulci, and the vaginal fornices; a douch of mercuric chlorid (1 : 2000 or 4000), or of creolin (2 per cent.), may be administered. 4. *Asepsis of the uterine cavity.* No difficulty will be experienced in gaining admission to the uterine cavity, since as long as any foreign material remains within the uterus closure of the cervical canal will not take place: the os will be found to be quite patulous. Asepsis of the cavum uteri will be accomplished in three stages: (*a*) *Curetment.* For this purpose a moderately sharp curet should be employed: the dull wire curet of Thomas will not answer. Tarnier suggests that before the curet be employed it might be well to scrub out the uterine cavity with a brush closely resembling that employed for cleaning the ordinary test-tube, and this operation he terms *écouvillonage*. We cannot see that this procedure is especially desirable, and would much prefer to proceed at once to the use of the curet. The instrument, well asepticized, should be carefully introduced to the fundus and the entire cavity energetically scraped, care being taken not to perforate the softened uterine wall. The perforated curet that allows a constant stream of sterilized water to flow over the site of operation is particularly to be recom-

mended. By it the field of operation is kept clean, and the detached fragments of tissue and placental débris are constantly washed into the receptacle placed to receive them. It is very important that all the recesses of the cavity be well scraped, especially around the tubal orifices and over the site of the placental attachment. Large fragments of placental tissue may be torn away with placental forceps, or the finger may be introduced and the pieces grasped and removed. Every portion of retained tissue must be removed before the curet is laid aside, thereby preventing further decomposition and ptomain-absorption. (*b*) *Irrigation of the uterine cavity.* All débris must be washed out by copious douches of warm sterilized water, which should be allowed to flow until it return clear in color and free from organic matter. (*c*) *Medicinal applications to the cavity.* Further disinfection may be secured by the introduction of some antiseptic agent. Most commonly employed is iodoform in the form of a bacillus or uterine suppository, in suspension in an oily fluid, or as iodoform-gauze. The iodoform increases diapedesis, and is claimed to be an excellent antiseptic to living tissue, although this has recently been vigorously contested. Ten to 30 grains of the drug may be used in the form of a suppository, which may be introduced into the cavity by a long pair of dressing-forceps. A mixture very highly recommended is one composed of 2 drams of iodoform in 3 or 4 ounces of warm sweet oil. If not antiseptic, the drug can at least do no harm. Other substances that may be employed in the uterine cavity for disinfecting purposes are a 10 per cent. solution of carbolized glycerin, tincture of iodin, a 5 to 10 per cent. solution of zinc chlorid, a 1 to 3 per cent. solution of creosote in glycerin, and a 1 per cent. solution of phenosalyl. Bonnaire suggests swabbing out the cavity with the following solution: Potassium iodid, 1½ drams; metallic iodin, 40 minims; water, 3 fluidounces; the entire solution to be mixed in a quart of steril-

ized water. Whatever substance be used, special care must be taken to secure an escape of the fluid in order that poisoning from absorption or too extensive cauterization shall not ensue. The most remarkable and gratifying results will follow such a course of treatment. Within a few hours there will be noted a marked fall in temperature: the patient will feel more comfortable, and her pain will have largely left her. It may be that the one treatment will answer, and the more thorough the first treatment the greater the probability of its sufficing. Upon the return of a rise of temperature, without delay a second curetment and intrauterine treatment must be performed, and the vagina packed with iodoform-gauze or a vaginal suppository of iodoform introduced.

(*b*) *General Treatment.*—The further introduction of septic material into the general system of the patient having been largely prevented by the preceding local course of treatment, the poison already absorbed must be eliminated and the woman sustained through the period of depression. The drugs most efficacious for these purposes are quinin in full doses, alcoholic stimulants to the utmost capacity of the patient, the cardiac stimulants, and a rich and nutritious diet in suitable quantities at frequent intervals. To these may be added germicidal agents as required, of which Madden prefers sulphurous acid in 30-minim doses every three hours, especially in cases in which the gastrointestinal disturbance is marked. Turpentine in capsules in doses of from 10 to 20 minims is also well borne in many cases. The quinin may be given in pill form, 8 to 10 grains daily, or by suppository. The whisky should be administered in the form of a milk-punch, half an ounce of the stimulant being given every three or four hours, and the quantity increased as the patient can tolerate it. Strychnin sulphate in doses of $\frac{1}{20}$ of a grain three or four times daily, the tincture of digitalis, 10 drops, three times in the day, or the tincture of strophanthus in

2- to 5-minim doses, may be of service. Under their administration the extreme rapidity of the pulse is regulated and the circulation brought under control. Bonnaire would further tone up the patient in the more pronounced cases of the disease by the hypodermic injection of from 8 to 10 drams of Hayem's serum (sodium chlorid ʒiss; sodium sulphate ʒiiss; water Oij). The diet should consist largely of milk with a small amount of lime-water every two to four hours. This may be supplemented by beef-extract, meat-broths, and other light liquid preparations. The diarrhea that is usually present may be regarded as one of nature's efforts to eliminate the poison from the system; for this reason, if the discharges be not too profuse and weakening, energetic treatment will not be indicated. Eulenberg and others have claimed that the copious discharges from the intestinal canal will not weaken the patient, and that they may be readily controlled at the proper time. Based upon this beneficial view of the diarrheal discharges of puerperal sepsis has arisen the treatment of the disease by saline laxatives in those cases in which the bowels are sluggish. Especially has this course of treatment been earnestly recommended by Schroeder, Seyfert, and Breslau. Under its influence the temperature falls and the local pelvic manifestations are improved. The remedies to be employed for this purpose are a saturated solution of Epsom salts, full doses of calomel or castor-oil, compound jalap-powder, and the Hunyadi and other laxative waters. The offensive odor of the stools may be corrected in part by the administration of the intestinal antiseptic agents, as salol, zinc sulphocarbolate, benzonaphthol, naphthol, or bismuth salicylate, in suitable doses. In addition to the action of the quinin and laxatives, the temperature may be reduced by cold sponge-baths with friction of the extremities, by the cold-water abdominal coil, or by the Kibbee cot (cold-water mattress). Cold baths, as in typhoid fever, have been successfully employed by Macé in those

cases in which the patient is not profoundly depressed or in which there do not exist peritoneal and broad-ligament involvement or other grave sequelæ, as phlegmasia alba dolens. The simple cases of puerperal septicemia may be much benefited by these baths judiciously employed. The *after-treatment* will consist in the free administration of tonics and in the cultivation of the appetite. A change of air and scene should be recommended when the patient has gained sufficient strength. Every precaution must be observed to prevent the development of intercurrent diseases, to which the woman is extremely subject from greatly reduced vitality.

(2) **Puerperal Phlebitis.** — *Synonyms:* Infectious phlebitis; Septicæmia venosa.—This is a very grave form of puerperal sepsis in which there occurs an acute inflammation of the venous channels of the uterine walls, with septic infection of the thrombi that normally block up their mouths: these thrombi, undergoing a rapid disintegration, induce general or localized embolisms. Beginning in a septic infection and inflammation of the uterine sinuses, the disease quickly spreads to the adjacent vessels in the pelvic connective tissue. Small emboli escape into the general circulation, inducing either a general pyemia with multiple abscess-formation, or causing localized thromboses in various portions of the body. Occasionally there occurs a rapid extension of the disease to the iliac and femoral veins, resulting in the familiar complication, phlegmasia alba dolens.

(*a*) *Uterine and parauterine phlebitis* (*phlebitis uterina; puerperal metrophlebitis*) is a peculiar septic process occurring late in the puerperal period, and originating in a primary infection of the thrombi formed in the mouths of the uterine sinuses immediately after the separation of the placenta. Labor may have been, to all appearances, absolutely normal: the first few days, or even three or more weeks, of the puerperium may have elapsed, and the patient

to all intents is out of danger and doing well. It is true that there may be an insidious onset, and a close investigation of the temperature-chart may reveal a trivial evening exacerbation to 99° or 99½° F., with a corresponding rapidity of the radial pulse and a slight flushing of the face —a group of symptoms not striking enough to cause any anxiety on the part of the patient and her friends. These prodromal manifestations may be absent, and the disease develop with an alarming abruptness. There may suddenly occur a rise of temperature to 103° or 105° F., associated with an anxious cast of countenance, great prostration, and marked rapidity of the pulse. This may or may not be preceded by a true rigor: generally the chill is not noted. After persisting for a few hours there very frequently occurs a break—either a decided remission or an intermission—in the fever, and with this it is not uncommon for a profuse perspiration to bathe the surface of the body. The patient may remain apyretic for a day or two or for more than a week, and then experience a relapse characterized by all the symptoms of the original attack. In other cases there is no remission, and the patient is extremely ill, with continued fever characterized by irregular exacerbations, profound depression, and a rapid running pulse. There are present certain evidences of gastrointestinal disturbance: the tongue is extremely coated; there is an unpleasant taste in the mouth; the appetite is poor or there is complete anorexia; and the bowels may be constipated. Pressure upon the abdomen does not, as a rule, elicit any tenderness, nor is meteorism to be noted. Local examination fails to elicit any special manifestations. The womb is undergoing the normal process of involution, and is not oversensitive upon manipulation: it is freely movable, in strong contradistinction to the cases of local pelvic peritonitis with pelvic exudate firmly fixing the heavy uterus in the pelvic cavity; pathologic masses of any description are conspicuous by their absence; the

lochia may be scanty, but are not characterized by foulness of odor. The only local clinical manifestation of uterine phlebitis is the occasional occurrence of an abrupt and very profuse hemorrhage, resulting from a dislodgement of one or more of the disorganized thrombi. This constitutes one of the most serious forms of puerperal or secondary postpartum hemorrhage: the flooding may be so profuse as to jeopardize the patient's life, and, indeed, the repeated hemorrhages may terminate fatally.

The *pathology* of this condition is not thoroughly known. Winckel, who has given considerable attention to the subject, claims that the thrombi are normally converted into tough cords of connective tissue through the agency of the leukocytes that wander in from the neighboring vasa vasorum; later these cords undergo canaliculation and the blood-current is restored. During this process of organization the thrombi form admirable foci for the accumulation of any pathogenic germs that may find entrance to the uterine cavity, and, once infected, a speedy involvement of the circulation follows. Bumm remarks that the thrombi that jut out from the placental site undergo disorganization primarily in the line of their axes: from these central points the process rapidly spreads peripherally until the endothelium and the vessel-walls become affected, and these break down into a mass of necrotic tissue into which have wandered numbers of leukocytes, and which contains immense numbers of the bacteria. The *diagnosis* of this condition is not an easy matter. The distinction between puerperal phlebitis and simple puerperal septicemia is exceedingly ill defined. In many cases only when there is noted an aggravation of the symptoms after an attempt at intrauterine irrigation will the phlebitic condition be suspected. The *prognosis* must necessarily be grave. The patient may perish suddenly from profuse hemorrhage, or emboli may be carried to distant regions of the body, either causing death from occlusion of some important arterial

trunk or giving rise to general pyemia. The course of the disease is protracted, often lasting from three to twelve weeks. The *treatment* can be general only. It has been found that when the uterine cavity is curetted and douched there almost invariably follows an exaggeration of the symptoms, or profuse hemorrhage may result. This is due to a further dislodgement of septic particles from the disorganizing thrombi, some of which are forced into the general circulation with disastrous consequences. The uterine cavity must therefore be rigidly avoided, except when there is a hemorrhage: this must be controlled by thorough tamponade of the cavity with a strip of iodoform-gauze, which may be left *in situ* for from eighteen to twenty-four hours, at the expiration of which time it may be removed and another introduced should the bleeding recur. The constitutional treatment will embrace the exhibition of stimulants in large amounts and the administration of nutritious food. Alcohol is best given in the form of whisky, in doses of from half an ounce every hour to a pint or more in a day. If whisky cannot be tolerated, brandy or wine (preferably champagne) may be substituted. The diet must consist mainly of milk, either fresh or partially digested, of which the patient may take as much as desired (three or four quarts). Beef-extract and other preparations of beef may be taken in the intervals in suitable doses. Digitalis, strychnin, quinin, and strophanthus may be employed as needed. Absolute rest must be enforced, and persisted in for at least two weeks after the subsidence of all symptoms.

(*b*) *Puerperal pyemia* (*septicopyemia; pyæmia metastatica; pyæmia multiplex*) is a grave manifestation of puerperal sepsis, a direct sequence of puerperal phlebitis, in which there occurs a profound involvement of the general system with the formation of purulent foci throughout the tissues and organs of the body. These abscesses are the result of multiple emboli carried into the circulation from the disintegrating uterine thrombi. Having once entered the

general circulation, the noxious particles are carried over the body, lodging here and there, and, wherever arrested, producing localized thromboses and infarcts which themselves may become the sources of other emboli. No portion of the body appears to be exempt from their invasion: the entire circulatory system is septic, and miliary abscesses and abscesses of larger size may form in the liver, spleen, kidneys, lungs, brain, and elsewhere. The areolar and subcutaneous connective tissue may become the seat of extensive suppurative cellulitis, being literally riddled with multiple abscesses. Moser has noted in two instances suppurative parotitis. The function of the liver may be so interfered with, as a result of the septic abscesses in its substance, as to result in a marked jaundice. Litten records the development of retinal hemorrhages; emboli may lodge in the eye, and a grave panophthalmitis with suppuration and destruction of the eyeball result; purulent foci may even form within the muscular substance of the body (*myositis purulenta puerperarum*); the pleura may be involved; and Hirst and Fussell record a case in which there occurred a thrombosis of the longitudinal sinus of the brain. *Symptoms.*—As may readily be imagined, the symptoms of this grave condition are very pronounced. There is profound physical depression, and in the later stages a rapid running pulse (which at first is only moderately accelerated); the temperature partakes more of the hectic type; there are abrupt elevations, with corresponding periods of apyrexia or even of subnormal temperature, though this is rare; after the formation of abscesses the temperature remains constantly elevated. The pulse loses its bounding character and becomes rapid and thready; a low, muttering delirium may supervene, with lucid intervals; the skin is dry and pungent; the tongue is darkly coated and fissured. Repeated chills are noted, occurring not only at the onset of the disease, as occasionally in simple sapremia, but also at irregular intervals throughout the entire course of the malady. These

chills occur more commonly in the morning and afternoon than in the evening and night. As in the preceding variety of sepsis, the local manifestations are slight: there may be at first some odor attached to the lochia, but this soon disappears; pelvic peritonitis may be present, but is rare, and generally the abdomen is flat or concave, tenderness not being elicited on manipulation. The *diagnosis* is plain. The *prognosis* is grave; death often ensues rapidly, or life may be prolonged for two or three weeks. The *treatment* is the same as that for uterine phlebitis.

(*c*) *Puerperal* (*septic*) *pneumonia* is but a special manifestation of puerperal pyemia, in which there occurs a thrombosis of the pulmonary artery or some of its branches, as a result of the lodgement therein of one or more of the septic emboli from the infected uterine sinuses. The symptoms are those of an acute pneumonia with marked dyspnea, pronounced depression, and feeble pulse. There will probably be associated septic abscesses elsewhere in the body. The onset of the disease is abrupt at a late date in the puerperium; the physical signs are not those of a typical croupous pneumonia: the course of the disease is irregular, and a fatal termination is frequent. Crepitation is not marked, and the sputum may or may not be rusty. The *treatment* must be sustaining, consisting mainly in the exhibition of stimulants and nutritious food, with local counterirritation over the affected region of the lungs.

(*d*) *Puerperal* (*septic*) *ulcerative endocarditis* is an exceedingly grave — perhaps the gravest—variety of puerperal pyemia. Not only does there occur a metastasis of septic material from the primary seat of infection to the left heart, but the pathogenic microbes themselves are carried thence, and continue in this organ their work of destruction. It is a late manifestation of the septic infection, usually not developing earlier than the second or third week of the puerperium. This special complication of the pyemia is ushered in by a pronounced rigor, associated with great elevation

of temperature and profound shock. The pulse becomes exceedingly rapid, at times dicrotic and very feeble, and is readily compressed; its rate may reach from 140 to 160 beats per minute. There may be experienced some pain in the region of the heart; purpuric spots will be detected over various regions of the body, and auscultation will reveal a loud systolic murmur in the mitral area, and at times a double aortic and mitral systolic murmur. Small emboli may be lodged in the retinal vessels, and retinal hemorrhage, with corresponding obstruction to vision, is generally noted. Low muttering delirium or a flighty condition is often present, and intense headache, jactitation, and insomnia may contribute to the gravity of the clinical picture. *Diagnosis.*—The recognition of this complication is not a difficult matter if the pronounced cardiac manifestations, the feeble and dicrotic pulse, the purpuric spots, and the grave general condition be taken into consideration. The *prognosis* is fatal. These cases invariably die in from five to ten days. The *treatment* can be symptomatic only, and will embrace the administration of strychnin, digitalis, or strophanthin, large amounts of alcoholic liquors, and a nutritious diet.

(*e*) *Puerperal Rheumatism; Puerperal* (*Septic*) *Arthritis.*—Not infrequently there has been noted in the puerperium a condition characterized by the occurrence of pains of a rheumatic nature, generally localized in or around the larger joints, and developing at any time from the second to the fifteenth or twentieth day after labor. It is now known that these pains are the result of a mild degree of septic intoxication, and as long as no organic changes occur in the affected joints the condition is designated *puerperal rheumatism.* Unfortunately, however, the morbid process shows a marked tendency to pass beyond a simple inflammation characterized by pain, redness, and swelling of the joints. The knee is especially prone to involvement in this specific process, and not rarely the articulating surfaces become seriously impaired, and abscess-formation with

subsequent ankylosis is the result. The *symptoms* of puerperal rheumatism are intense pain in the affected joint, with great swelling and redness of the surface. Charpentier describes the color as a "claret-red, a blue, or a pale-rose." Associated with these local manifestations are a considerable elevation of temperature (103°–105° F.), which is often preceded by a chill, and a corresponding increase in the rapidity of the pulse, which ranges from 110 to 140 beats per minute. As a rule, there are no changes in the vaginal and pelvic conditions. The lochia does not become offensive, nor will manipulation of the uterus elicit abnormal tenderness. It is not exceptional for vague pains to be experienced in other remote regions of the body, and the patient may even develop a well-marked pleurodynia or severe myalgic pains in the back and shoulders. The inflammatory process may, though rarely, exhibit the ordinary fugacious character of simple rheumatism, and shift from one large joint to another with astonishing rapidity, the course of the disease being thus protracted to a considerable length. Very generally the trouble is stationary in the joints primarily affected. Frequently profuse perspiration will also be noted. When the inflammation advances to suppuration a different clinical picture presents itself. The general symptoms now assume more of a hectic type. The chills are of repeated occurrence, and soon the edema and puffiness of the joints indicate a formation of pus. *Diagnosis.*—The diagnosis between puerperal arthritis and simple acute rheumatism is not always an easy matter. The main points of differentiation consist in the following:

Puerperal Arthritis.	*Simple Acute Rheumatism.*
Two or more joints are liable to be simultaneously affected, and there is usually no metastasis from joint to joint.	The disease very commonly shifts from one joint to another, that first affected improving as the next becomes inflamed.
There is a great tendency to suppuration.	The tendency to suppuration is not marked.
There is pronounced physical depression.	Prostration is not so pronounced.
The patient may die suddenly from embolism.	Death is very rare.
The salicylates and ordinary antirheumatic remedies fail to give relief.	Responds readily to the usual antirheumatic remedies.

Prognosis. — Necessarily, the prognosis is doubtful: the condition may develop into one of general pyemia, or sudden death may ensue from pulmonary, cardiac, or cerebral embolism. At the best, the course of the affection is protracted and tedious. *Treatment.*—The salicylates and other antirheumatic remedies are absolutely inefficacious in relieving the symptoms. This may be regarded as a therapeutic test of the septic nature of the disease. Relief can be secured only by insisting upon absolute rest of the affected joints as well as of the entire body, together with the administration of full doses of alcoholic and other stimulants, the ingestion of plenty of nutritious food, and an appropriate course of local treatment, consisting in counterirritation by tincture of iodin, and the application of ointments of ichthyol, belladonna, or mercury. After there has occurred a subsidence of the active inflammation, gentle massage and passive movements of the joint should be instituted in order to avoid the production of ankylosis, to which, as has been noted, there is a strong predisposition.

(*f*) *Femoral* or *crural phlebitis* (*phlegmasia alba dolens; milk-leg; anasarca serosa; white-leg; œdema lacteum; peripheral venous thrombosis*) is a peculiar late manifestation of puerperal sepsis in which there occurs a thrombosis of the iliac or femoral veins on one side, usually the left, with an immense edema of the affected limb, which presents a characteristic white or milky appearance from which has originated the appellation of "milk-leg." The disease was formerly attributed to a metastasis of milk from the mammary glands, and by some the popular name is believed to have thus originated. It is possible for phlegmasia alba dolens to occur as a sequel of uterine phlebitis, coagula being carried from the placental site into the hypogastric veins: lodging here, they obstruct the flow of blood through the crural veins. Again, the disease may occur as a result of a direct extension of an inflammatory pro-

cess originating in a phlebitis of the uterine sinuses, the veins of the pampiniform plexus of the broad ligament next becoming involved, and finally the iliac and femoral veins; or the affection may be purely localized in its origin, beginning as a crural phlebitis. In the former instance (*thrombotic phlegmasia*) the prominent clinical manifestation, edema, is first noted at the ankle, from which it rapidly rises until the entire limb is involved. In the primary pelvic variety the edema progresses steadily downward from the groin to the foot: it then results not so much from the primary formation of thrombi in the veins as from direct pressure exerted by the inflammatory exudate thrown out around the pelvic veins of the corresponding side; this condition has been termed by some writers *pressure-thrombosis*, and by others *cellulitic phlegmasia*. Pressure-thrombosis may occur during the later weeks of pregnancy, inducing all the manifestations of phlegmasia before childbirth. *Etiology*.—The direct causation of the disease has already been indicated. There are, however, some predisposing factors that favor its development. Among these may be mentioned the hyperinosis peculiar to pregnancy; weakness of the system from multiparity or some systemic dyscrasia; the increased tendency of the blood to clot during an acute anemia dependent upon a profuse hemorrhage, as from retained placenta, relaxation of the uterus, or placenta prævia; grave obstetric operations or extreme prolongation of labor; and, finally, an acute exacerbation of some preexisting pelvic inflammatory disease, as an old pelvic exudate. *Symptoms*.—As has already been stated, phlegmasia alba dolens is a late manifestation of sepsis, occurring usually in the third or fourth week of the puerperium, and more rarely as early as the second week. Until the onset of the disease the patient may have been progressing satisfactorily. Then there occurs, more or less abruptly, an elevation of temperature to 101° or 103° F.; a marked rigor may or may not precede the fever. The

patient is depressed and uncomfortable; she is fretful and generally indisposed to exertion; she cannot sleep and tosses from side to side; there is an unpleasant taste in her mouth, and other evidences of gastrointestinal disturbance—furred tongue and torpidity of the bowels—exist. The pulse is rapid and full. If she be nursing her child, the latter will by its constant crying indicate an alteration in the quality of the milk, or lactation may be completely arrested. The lochia are diminished in amount and are extremely fetid. There now appears the *premonitory sign of Meigs*, upon which considerable stress has been laid—namely, severe cramp-like pains in the calf of the affected leg: this pain is very constant, although not always beginning in the calf. It may start above in the pelvic region and extend down toward the knee, following the course of the femoral vein, or it may begin below in the foot and ascend. Whatever its origin, it is very marked and very characteristic of the affection. The patient cannot move her limb without causing an exacerbation of her sufferings. Edema promptly supervenes, and the limb assumes the peculiar dead-white, glistening appearance that has originated the popular name "milk-leg." The swelling is extreme; pittings half an inch or more in depth result from digital pressure. The leg is sensitive to the touch at first, but this rapidly disappears with the increasing edema, until the impression given to the sufferer is that of a dead limb. A painful line of induration may extend along the course of the femoral vessels, and local thermometry reveals an increased temperature of the part; there is also more or less duskiness of the skin of this region. The inguinal glands are hard, enlarged, and sensitive, and the edema may extend over the iliac region of the abdomen and into the external genitals. The *course* of the disease is not constant. The fever is subject to marked variations: it may be persistently high, or may gradually fall from the initial rise and entirely disappear in the more favorable cases long before the limb has returned to its normal pro-

portions. If suppuration occur, the temperature-chart shows the characteristic hectic type broken by irregular chills. The disease may be limited to one limb, or both may be involved either simultaneously or, more often, consecutively. The *duration* of the disease varies greatly. The acute symptoms generally subside in from one to two weeks, but the local manifestations may persist long beyond this period, or the limb may never regain its original healthy condition. The *terminations* of phlegmasia alba dolens are—complete resolution, occurring in at least one-half of the cases; suppuration with local abscess-formation, especially common in the cellulitic variety; general pyemia with metastatic abscess-formation; or gangrene and death. *Diagnosis.*—There can be no difficulty in diagnosticating phlegmasia alba dolens. There is no other condition that in any respect resembles it in its clinical manifestations. The *prognosis* must be guarded. Not only is there the possibility of a fatal outcome, but there is always more or less danger of permanent disability of the limb. Death, when it occurs, results from exhaustion following general pyemia or gangrene, or from embolism of some important venous trunk. It has been estimated that a mortality of 33 per cent. attends the disease. Should the thrombosis of the femoral vein fail to be absorbed, there will result varying degrees of disability of the limb until venous anastomosis occur of sufficient size to compensate for the occluded vessel. This may require months or years, and during this period the patient is invalided. *Treatment.*—As in the other forms of puerperal sepsis, the constitutional treatment of phlegmasia alba dolens is mainly supporting. The diet must be liquid, but very nutritious, consisting largely of milk (peptonized, if necessary), beef-extracts, broths of various kinds, oyster-soup, and clam-juice. Whisky should be exhibited in suitable amounts according to the condition of the patient's pulse. Tonics, including iron, strychnin, and quinin, are always indicated in full doses; the bowels must be kept

patulous by gentle laxatives only, free purgation, except at the onset of the disease, being contraindicated. For the pain, opiates, preferably Dover's powder or hypodermic injections of morphin, are essential, and for the insomnia later in the disease mild hypnotics are of service. Absolute rest must be enjoined, not only of the affected limb, but of the entire body, to overcome the tendency to additional thrombosis or the detachment of emboli. Recently a solution of potassium nitrate in 5-grain doses administered hourly was employed by Hovnanian in the acute stage of the disease, with the most satisfactory results: the symptoms ameliorated rapidly, and in two or three days the patient was practically convalescent. Locally, there is not much that can be done. The affected limb must be elevated slightly and allowed to rest upon a pillow: it should be kept absolutely quiet and handled as little as possible. During the initial inflammatory stage anodyne poultices containing laudanum, belladonna, and other sedatives may be applied along the course of the femoral vein, and the whole covered with oiled silk to maintain a certain degree of moisture in the parts. When the edema is marked and the limb becomes cool from sluggishness of the circulation, its temperature may be maintained by enveloping it in layers of surgical cotton. After the subsidence of the acute inflammatory symptoms, ointments of lanolin containing ichthyol, belladonna, or iodin may be gently rubbed in the skin over the femoral vessels, and potassium iodid or ammonium chlorid exhibited internally, to favor absorption of the clots and exudate. As the swelling disappears cautious massage of the part may be attempted, but the possibility of producing embolism must be constantly borne in mind. Should abscess result, free incision under absolute antiseptic precautions becomes necessary, and drainage must be secured. If embolism occur, the treatment is that already indicated. In case gangrene develop, amputation above the line of demarcation must be

performed and the case treated surgically. *Convalescence* is necessarily protracted. During this period the patient must be restrained from undue haste in rising from her bed. Even after she is permitted to rise she should employ crutches for some time in order to avoid using the weakened limb until the clots have fully disappeared or danger of embolism has passed. An elastic bandage will be a source of much comfort to her in supporting the relaxed tissues and preventing the development of edema. It must be remembered that relapses are not uncommon, and may be precipitated by injudicious haste or exertion during the convalescence. Tonics and rich diet are essential, and as soon as possible the patient should be removed to the seashore or the mountains, where she may the more rapidly recuperate her strength.

(3) **Puerperal (infectious) erythema** (*scarlatiniform erythema*) is a rare manifestation of puerperal sepsis characterized by the development upon the skin—usually in the folds of the body, although at times upon the entire surface—of a bright-red punctate eruption, associated with a moderate febrile reaction and general malaise. With this there is more or less suppression and odor of the lochia, and there may or may not be uterine tenderness. The fever is very moderate, seldom rising over 100° F., and is unaccompanied by chills. The general depression is not profound: there are anorexia, constipation, and fetor of the breath; the tongue is coated; the pulse is somewhat increased in rapidity; but there is no gravity connected with the condition. The eruption closely resembles that of scarlatina, and, while most marked on the trunk and neck, may rarely occur on the face and extremities: there is occasionally associated with it an intense pruritus, and vesicles have been noted at various points of the body. There is no accompanying angina, nor is there any albuminuria. The rash quickly fades, and may be followed by a slight desquamation. The *diagnosis* is plain. The *prognosis* is good. *Treatment* con-

sists in cleanliness of the genital tract and the exhibition of tonics and stimulants. A vaginal and intrauterine douche of hot water or of creolin will generally result in a cure.

(4) **Puerperal (septic) infectious pemphigus** is an exceedingly rare manifestation of puerperal sepsis, in which the disease appears in the form of a pemphigoid skin-eruption covering at times the entire cutaneous surface. The blebs first appear on the fourth or fifth day of the puerperium, are of various sizes, and are attended by a moderate degree of systemic involvement. There is a slight acceleration of the pulse-rate and a moderate elevation of temperature, as a rule not exceeding 101° F.; the face is moderately flushed, and there is more or less physical depression. The lochia are somewhat suppressed, and may or may not become fetid. The local pelvic manifestations are slight. A curious feature of this mild variety of septic infection is its tendency to spread throughout the ward in which it first appears, and for this reason the patient should be isolated and the room well fumigated after her recovery. The *diagnosis* of the condition is patent; the *prognosis* is good. The *treatment* is the same as that of the other forms of sepsis. The blebs may be protected by soothing ointments and covered by pieces of antiseptic lint.

(5) **Puerperal Tetanus** (*Tetanus Puerperarum*).—Very rarely during the puerperium there may develop a true condition of tetanus due to the invasion of the system by Nicolaier's bacillus of tetanus. Like the preceding, it is an exceedingly contagious affection, and a patient suffering with the disease should be isolated. *Etiology.*—The exciting cause is the introduction into the system of the specific germ of the disease. Among the *predisposing causes* that will render the system more susceptible to the action of the germs are warmth and moisture of climate; lack of cleanliness of the parts; primiparity, mainly because in primiparæ abrasions and lacerations of the soft structures are most common; unhygienic surroundings;

exhaustion from mental anxiety or emotion or after protracted and tedious labors. The disease is just as likely to follow abortion or miscarriage as it is to occur after labor at term. *Symptoms.*—Puerperal tetanus usually appears at any time during the first and second weeks, but may develop as late as the fourth or fifth week after labor. The symptoms are practically the same as tetanus in the nonpuerperal state. The disease begins with feelings of general malaise and a sense of aching and drawing about the fauces. The pain is increased when the patient attempts to swallow, and finally develops into marked dysphagia. The countenance is anxious; the temperature is not much elevated, seldom rising over 100° or 101° F.; the pulse is rapid and weak. The spasmodic muscular action soon involves the muscles of the trunk, and the patient may develop marked opisthotonos or emprosthotonos. The dysphagia becomes absolute, and unless relief be promptly afforded the woman soon perishes from exhaustion. The *diagnosis* should not be difficult. The *prognosis* is very grave. According to Vinay, the mortality is as high as 88.8 per cent. The *treatment* consists mainly in absolute cleanliness and the observance of prophylaxis. Upon the slightest sign of beginning tetanus the patient should be subjected to a thorough curetment of the uterine cavity, followed by copious intrauterine and vaginal douches of creolin (2 per cent. solution) or of mercuric chlorid (1 : 4000). After the disease is well developed such procedures may be followed by beneficial results, but more probably they will only aggravate the condition. To allay the spasms, chloral hydrate, morphin, or curare hypodermically, and inhalations of chloroform, may be tried. Recently good results have been claimed from the use of the antitoxin of Tizzoni and Cattani (a solid substance obtained by treating blood-serum with alcohol and allowing it to dry in a vacuum). This is administered in doses of from 15 to 20 cm. daily in solution in sterilized water, and it should be given

as soon as the disease manifests itself. It is as yet too early to give any statistics bearing upon the value of this remedy.

(6) **Puerperal neuritis** may be septic or non-septic in origin. The latter variety may be designated as a *pressure-neuritis*, a *traumatic neuritis*, or a *pressure-degeneration of the nerves*, dependent upon irritation of the pelvic nerve-plexuses by the gravid uterus, or arising from actual injury of these structures during the process of parturition, especially if instrumental measures have been resorted to. The protected situation of the pelvic nerve-trunks, lying as they do mainly within a bony recess near the sacrum, is the only reason why more serious pressure-symptoms than are generally noted do not arise. In the elliptic variety of the pelvis, fortunately very rare, they are not thus protected. This pressure-neuritis is characterized by severe lightning-like pains extending down the course of one or both sciatic nerves and associated with more or less cutaneous hyperesthesia. This may persist for one or two weeks, and then gradually pass away, or there may follow paralysis of one or both limbs. *Treatment* consists in courses of gentle massage, together with the application of mild electric currents. Another variety of nonseptic puerperal neuritis, according to Lamy, is that arising from an extension of pelvic inflammation to the nerve-trunks, with secondary disease of these structures.

Aside from these nonseptic forms of the disease, there undoubtedly is a true septic variety of puerperal multiple neuritis dependent upon the absorption of pathogenic substances from the birth-canal. This variety of sepsis has been recognized only since 1888, when Möbius first described it, and all observers agree that it is of extremely rare occurrence. *Etiology.*—The predisposing cause of the disease appears to be a depressed or cachectic condition of the system, as that induced by mental or physical strain or by an insufficient action of the kidneys, the blood being in consequence overloaded with effete material. The

exciting cause is the introduction into the system of septic material. *Symptoms.* — The clinical manifestations vary greatly. The disease may appear in the later weeks of pregnancy, or may not manifest itself until the puerperium be well established. The patient may gradually develop paroxysms of pain in the affected region, or the onset may be abrupt and the disease reach its acme at once. Most commonly the nerves of the upper extremities—the median and ulnar—are involved, and in these cases the affection is generally bilateral: when the pelvic plexuses of nerves are involved, there is usually developed a unilateral form of the disease, manifesting itself in the lumbosacral or crural regions. The *symptoms* are pain, of a severe lancinating nature, limited to the lines of the nerves; the pulse is accelerated; the action of the heart is at times irregular; the countenance is anxious; respiration is often impeded, or even severe spells of dyspnea may supervene. There may be some edema of the face and extremities. There quickly follows upon these acute symptoms a progressive numbness and weakness of the affected extremities, ultimately resulting, in some cases, in absolute paralysis. The muscles of the pharynx may be involved, and there then occurs more or less dysphagia; if the eye-muscles be involved, diplopia occurs. The reflexes are diminished or abolished, and the muscles do not respond promptly and completely to electric stimulus. There may be a certain degree of vertigo, and slight facial paralysis may be noted. Some patients become absolutely paraplegic. The *diagnosis* of the condition should be easy. The *prognosis* must be guarded, and will depend largely upon the severity of the attack. It is good for the milder forms of the disease, but doubtful for the generalized forms, and grave when there occurs pharyngeal involvement. If the paralysis be well marked, there may never be a complete recovery. *Treatment.*—For the pain injections of morphin may be required, and Eulenberg suggests injections of a 2 per cent. solution of phenol along the seat of the nerve. Strychnin

and curare in moderate doses may be of service in restoring muscular tonicity. Thorough cleanliness of the parturient tract is essential, and the patient must be placed upon a rich nutritious diet and on full doses of tonics, including quinin, arsenic, and iron.

Class II. Local puerperal sepsis—that variety in which the sepsis is mainly localized in or around the uterus and its adnexa, including the forms dependent upon lymphatic absorption, and those cases in which there is a localized inflammatory process beginning in the genital tract and extending to the subjacent tissues.

1. Lymphatic Infection (Septicæmia Lymphatica; Puerperal Lymphangitis).—The poisonous material is rapidly absorbed by the lymphatics of the uterus and the vagina, whence it is carried to the intricate network of lymphatics in the broad ligaments and the pelvic fascia. According to the region that is most actively concerned in the morbid process is the condition to be recognized as a puerperal metritis, a puerperal pelvic cellulitis, or a puerperal peritonitis. There is always associated with these processes more or less systemic involvement: the local symptoms are, however, more prominent.

(1) **Puerperal Metritis.**—In this grave form of late puerperal sepsis the immensely hypertrophied lymph-channels running through the uterine walls become the site of a most active septic process. This condition may be, and often is, secondary to a septic endometritis of virulent form, or it may result from a primary lymphatic involvement, the inflammation spreading from the lymph-channels to the surrounding connective tissue and thence to the muscular substance. According as to which of these origins the disease may have had, infection has occurred at the placental site or through lacerations or abrasions of the upper vaginal tract. The *symptoms* are at first those of a simple putrid infection. There is a chill followed by fever of a slight intensity. The lochia become partially suppressed, of increased consist-

ence, and later of a very fetid odor. There is a moderate amount of pain localized in the uterus and its immediate proximity, and there may occur a slight amount of abdominal tympanites. The patient suffers more or less from severe after-pains. The pulse is not very rapid. There frequently occurs in the affected portions of the endometrium and metrium a rapid disintegration of tissue, so that the lochia are soon found to contain fragments of necrotic tissue and detached portions of muscular fibers that have sloughed from the uterine wall: at times an entire cast of the uterus may be shed, and to this stage of the disease has been given the name of *dissecting* or *gangrenous metritis* (*metritis gangrænosa*). The areas of ulceration are limited in size, rarely exceeding an inch or two in diameter. Palpation shows a marked increase in the size of the uterus, which is soft and boggy to the touch and very sensitive. Manipulations must be practised with the utmost care, as the necrotic areas may be very thin and yield on pressure, thus affording direct communication between the uterine and pelvic cavities. Such an accident may occur spontaneously from active sloughing of the parts, and this condition is described as *perforating metritis*. General peritoneal infection may be prevented by the bands of inflammatory lymph that are usually thrown out around the attenuated portions of the uterine wall; otherwise, a rapidly fatal termination may be looked for. In some instances minute abscesses form throughout the uterine wall in immense numbers, the organ being riddled with them, and resembling on removal an immense sponge from which streams of pus emerge when pressure is made upon it (*phlegmonous metritis* or *metritis purulenta*). These pus-foci are localized mainly along the line of the connective-tissue fibers. In the later stages of this disease, if there have occurred an extension of the process to the uterine sinuses, emboli may be cast into the circulation, and the patient develop a general pyemia with profound systemic

depression. It is quite possible, however, for the disease to remain localized in the uterine walls for days or even weeks without grave systemic involvement, and even without an involvement of the tubes and ovaries. The *diagnosis* of this condition may be made by the increased size and tenderness of the uterus and by the gravity of the local manifestations. The *prognosis* is grave, once the true uterine substance is involved: very commonly these patients die of profound blood-poisoning or of a rapid extension of the disease to the peritoneum with general peritonitis. *Treatment.*—In the early stage the uterine cavity should be well douched with creolin or mercuric-chlorid solution. If, notwithstanding this measure, the fever continue and the condition of the patient be not materially improved, a thorough curetment of the uterine cavity is in order. When the disease has invaded the muscular tissue and pus-foci have formed, the removal of the endometrium is useless: the seat of the disease is beyond the reach of the curet. Experience has likewise clearly demonstrated that the performance of salpingo-oöphorectomy is of no avail in these cases, since the uterine walls are themselves involved, and the disease is not eradicated by this procedure. There remains, therefore, hysterectomy as the only operative procedure that will give the patient the best chances of recovery. As to when this operation should be performed opinions vary. It would appear that the most favorable period lies somewhere between the first few days after the infection and its generalization. The vast majority of the operations performed after the seventh or eighth day of the disease have thus far resulted fatally, while those performed earlier have almost as uniformly resulted in a perfect cure. If any doubt exist as to the true state of the uterine walls, an exploratory incision would be justifiable, and if they be found to be soft and spongy, the organ should be extirpated.

(2) **Puerperal Pelvic Cellulitis (Puerperal Parametritis; Puerperal Perimetritis).**—By this term is indicated

that condition of local lymphatic infection in which there is a special involvement of the cellular tissue of the pelvis extending up to, but not involving, the pelvic peritoneum. This condition is not so common as is true pelvic peritonitis. It may result from absorption of septic material through abrasions in the lower birth-canal; it may be the result of direct traumatism with septic infection, as in severe cervical lacerations involving the vaginal vault and submucous tissues; or it may occur secondarily after pressure-necrosis of the vaginal tissues. Having once involved the vascular and loose connective tissue, an acute inflammation is started, and this spreads rapidly between the layers of the broad ligament and through the pelvic fascia in all directions. The process is generally limited by the peritoneal investment, although the ovary may be involved (*puerperal ovaritis*), as well as the other structures surrounded by the diseased cellular tissue. A marked exudation, partly serous and partly cellular, is quickly thrown out, so that digital exploration detects a firm hard mass closely simulating in feel a fibroid tumor of the uterus. The vaginal fornices are tense. The uterus is immovably fixed and pressure elicits tenderness. Should the peritoneal covering of the uterus share in the process, the condition is known as *pelvic perimetritis*, constituting a variety of pelvic peritonitis. The *symptoms* of pelvic cellulitis are largely local, although there is more or less constitutional involvement. The patient has a decided elevation of temperature—to 101° or 103° F. This is associated with chills or chilly sensations, malaise, headache, anorexia, and systemic depression. The lochia become scanty and offensive, and the patient complains of pain localized in and around the uterus. There may be developed more or less edema of the limb upon the affected side, a direct result of the mechanical pressure exerted by the pelvic exudate upon the large venous trunks. The *course* of the disease is toward resolution or suppuration. In the former instance

there occurs primarily an absorption of the serous effusion, and, more slowly, of the cellular exudate, the woman finally recovering, possibly without even bands of inflammatory adhesion to mark the morbid process. In other instances the solid exudate may persist in the form of adhesions, inducing uterine displacement and distortion of the other pelvic viscera, and necessitating at some subsequent date an operative procedure to relieve the patient. Again, the inflammatory process may become so diffuse and so virulent that a rapid necrosis of tissue takes place and a large *pelvic abscess* results. This very commonly occurs, and suppuration is indicated by a hectic type of symptoms and by the presence of a soft fluctuating tumor where primarily had been detected a mass of firm exudate. The abscess shows a tendency to point in the inguinal region just above Poupart's ligament, but it may open into the vagina, rectum, or bladder: it may burrow downward and point upon the thigh as a psoas abscess or near the great trochanter, or posteriorly and simulate a perinephritic abscess, or point to the side of the sacrum. As a rule, resolution or suppuration will have been accomplished within ten days or two weeks. The *diagnosis* of pelvic cellulitis is not always plain. It is difficult at times to differentiate between this condition and pelvic peritonitis; in fact, not infrequently the two coexist. In the following table are to be found some of the most essential points of difference:

Pelvic Cellulitis.	*Pelvic Peritonitis.*
Very rare.	Of very frequent occurrence.
No abdominal distention, as a rule.	Marked distention, with tympanites.
Bimanual examination reveals a mass situated in the affected side; the uterus is displaced to the opposite side of the pelvis.	Bimanual examination reveals a solid mass of exudate surrounding the uterus on all sides.
The uterus may be normal in size or only moderately subinvoluted.	There is marked subinvolution of the uterus.
There is moderate constipation.	There is marked constipation.
Moderately severe constitutional symptoms.	Very marked constitutional manifestations.
The tendency is to abscess-formation, with rupture externally or internally.	There is no formation of abscesses.
With the appearance of pus the symptoms assume the hectic type.	There are no hectic symptoms.

Prognosis.—Generally the prognosis of pelvic cellulitis is good as concerns life. Within a week or two resolution or suppuration will have occurred. If rupture of the pelvic abscess take place internally, the patient may die from general peritonitis or from exhaustion following the formation of a fistulous tract. After pus-formation the progress of the disease is tedious, although the patient may eventually recover without any serious sequelæ. *Treatment.*—The management of a case of puerperal cellulitis is essentially local. In the first place, it includes efforts at allaying the pelvic inflammation. Thorough asepsis of the uterus and vagina is secured by frequent vaginal douches of mercuric-chlorid solution (1 : 2000) or of carbolic acid (1 : 40). Probably nothing has afforded more relief to these patients than the application of cold compresses or the ice-bag to the lower abdomen and the perineum. In the acute stage Kisch's method of intravaginal irrigation with cold water may be tried. The pelvic congestion may, in plethoric cases, be materially relieved by the application of a few leeches to the groin of the affected side. Ointments of ichthyol, belladonna, or mercury, or of potassium iodid, may also be applied in the inguinal region, as well as counterirritation by tincture of iodin or weak solutions of croton oil. The vaginal vault and the cervix may also be painted with iodin, and disinfection secured by a vaginal suppository of iodoform, 20–40 grains. The fever must be combated by suitable antipyretics, mainly quinin in full doses, while the depression is overcome by tonics and stimulants as required. Potassium iodid in 5-grain doses three times daily may prove efficacious in absorbing the exudate. If suppuration occur notwithstanding these measures vigorously employed, early evacuation of the abscess is imperative. This is best accomplished through an incision made just above (1 or 2 cm., 0.3937 or 0.7874 in.) and parallel to Poupart's ligament, and about 2 or 3 cm. (0.7874 to 1.1811 in.) from the anterior

superior iliac spine, peritoneal involvement thereby being avoided. Evacuation through the vagina may become necessary in neglected cases, but this procedure is not to be recommended as a primary measure, because of the increased risk of septic infection. When spontaneous rupture has occurred into the vagina or rectum, as thorough drainage and disinfection as is possible must be secured, and the patient sustained during the period of suppuration. Not uncommonly such patients pass into the hands of the abdominal surgeon for permanent relief by operation.

(3) **Puerperal Peritonitis, Pelvic or General (Peritonitis Puerperalis).**—Septic puerperal inflammation of the peritoneum is of rather rare occurrence. It may be induced in one of two ways: either it is entirely lymphatic in origin, the primary seat of the disease being remote, in the vagina or vulva, and infection occurring through the lymph-channels; or it arises secondarily to uterine and tubal infection by direct contiguity of tissue, the inflammatory process extending through the fimbriated extremities of the tubes, or directly through the uterine walls (*metro-peritonitis*), following the network of intramuscular interspaces. Whatever its origin, the disease begins as a localized affection involving only the pelvic peritoneum, or, it may be, but a limited portion of this (*pelvic peritonitis*). A high grade of inflammation is rapidly produced, and this through its extreme intensity is very prone to limit itself through the agency of the exudate that is promptly thrown out around the focus of disease. At the site of the disease, however, there often ensues a rapid destruction of tissue, and deep localized abscesses of various sizes are produced within the pelvic cavity. These burrow in the direction of least resistance, and discharge themselves into the rectum, vagina, or bladder, or are evacuated by surgical measures. The *symptoms* attendant upon this condition are mainly pelvic. There is intense pain in the region of the uterus and ovaries, as manifested by the

dorsal decubitus and drawn-up thighs. Vaginal exploration made with the utmost care reveals an immobilization of the uterus, together with the presence of an extremely sensitive mass to one or the other side or completely filling the cavity of the pelvis. More or less abdominal tympany is noted. The countenance of the patient is anxious and drawn; her pulse is rapid and wiry; there is a moderate rise of temperature and some degree of prostration.

If, now, the limiting bands of inflammatory lymph become invaded and the inflammatory action extend beyond their confines, a rapid involvement of the entire peritoneal surface follows, and the patient quickly succumbs. This *general puerperal peritonitis* is, fortunately, very rare. An examination of the abdominal cavities of patients dying of this condition reveals the intestinal coils bathed in a thin, creamy pus, and here and there bound together by delicate bands of plastic exudate. The pus, examined bacteriologically, is found at times to contain vibriones, micrococci, and the bacilli of putrefaction. Occasionally (*peritonitis puerperalis lymphatica, or fulgurant puerperal peritonitis*) no pus or exudate of any kind, save a greenish or brownish fluid, will be discovered, the patient being overwhelmed by the septic intoxication and perishing before inflammatory action is begun. The *symptoms* of general puerperal peritonitis are not nearly commensurate with the serious character of the disease. Save for the extreme rapidity of the pulse—which rapidly reaches 130 to 180 beats per minute—and the profound general depression, the clinical manifestations are not marked. Owing to the general paralysis of the intestinal walls, abdominal tympany is constant, and may become quite marked, especially toward the close. Tenderness on percussion will be noticed in the early stages, but as the disease progresses this may be entirely lost, the woman not complaining of the most vigorous abdominal manipulation. There may be moderate vomiting, although this also may be absent throughout. The temperature

varies: generally it is not very high, but it may reach a very high mark just before death supervenes; in other, notably the fulgurant, cases there may be a subnormal temperature from the beginning, and the patient be comatose throughout. Generally the woman retains consciousness until the end. The bowels are markedly constipated, the urine is scanty and febrile, the breath is foul, and the tongue is coated. There is always intense thirst. The *diagnosis* of puerperal peritonitis is evident. The *prognosis* of the local variety is good if it can be properly managed. The general form almost inevitably proves fatal. *Treatment.*—When a puerperal patient has once developed a peritoneal inflammation she should be rigidly watched. As long as the disease remain localized in the pelvic cavity medical treatment may avail much. Internally, quinin, iron, and stimulants must be pushed to their utmost limit, while, locally, pain may be relieved by opium suppositories or by an occasional hypodermic injection of morphin sulphate. The inflammation may be relieved by frequently repeated poultices or stupes; salines, if used at all, should be administered in small amounts, and preferably at the onset of the disease. A 2 per cent. solution of cocain in 10-drop doses may correct the vomiting; and tympany, if extreme, may be relieved by the cautious introduction of the rectal tube or by small enemata of milk of asafetida. For the thirst rectal injections of hot water may be given or the patient may be permitted to suck fragments of cracked ice. Once the limit of the pelvis is exceeded, the case becomes a surgical one. An abdominal incision must then be made, and the peritoneal cavity well flushed with hot water in order to remove all purulent or plastic exudate. Treatment, at the best, is of but little value when the disease has progressed thus far. The surgical treatment of this form of puerperal sepsis is much more effective if attempted at an early period, before involvement of the general peritoneal cavity has taken place. Abdominal section performed early and the ap-

pendages removed (if they be the menacing seat of the disease), or supravaginal hysterectomy performed (if the primary disease exist in a suppurative metritis), will give a much more promising outlook to the patient than when attempted later in the course of the disease. This is a serious question, however, and no fixed rule can be formulated to which every given case can be made to conform. Inauspicious as these late and neglected cases are, they should in every instance be given the one chance left them in abdominal section. A fatal termination is almost inevitable with the operation, and absolutely so without it.

2. Involvement of the Genital Mucosæ.—(1) **Vulvitis.**—Puerperal inflammation of the vulva is seldom found alone, but generally in association with a similar inflammation of the vaginal mucosæ. It is not surprising that these parts should become at times the seat of a septic infection, if it be remembered to what severe contusions and lacerations they are subjected during the process of parturition. The process may assume the form of a simple catarrhal or suppurative inflammation (*vulvitis catarrhalis*); a higher grade of inflammation may be produced, and ulcers and abscesses result—*phlegmonous* or *ulcerative vulvitis* (*vulvitis purulenta*); or there may occur such a devitalization of all the tissues that they die *en masse*, when the condition is known as *gangrenous vulvitis* (*vulvitis gangrænosa*). A rare and very unfavorable variety of vulvitis is that characterized by the formation of diphtheric patches, *diphtheric vulvitis* (*vulvitis diphtheritica*). *Symptoms.*—There is more or less edema of the vulvar tissues, both lips usually being involved, although one is generally more tumescent than the other; the mucous surfaces are reddened, and at first dry, glazed, and hot; later the lips are bathed in a creamy fluid if the case be one of simple catarrhal inflammation. In the phlegmonous form small ulcerations quickly develop throughout the substance of the labia, and especially are the glands of Bartholini liable to share in the process and sup-

purate; if the inflammation be more intense, a necrosis of the mucosa and submucosa will ensue, sloughs of considerable extent at times separating and leaving deep excavations or ulcers, bathed in a grayish-yellow exudate, which, if the woman survive, must heal by a tedious process of granulation. The pus from these ulcers contains large numbers of streptococci and other bacilli. In the diphtheric variety characteristic grayish patches of membrane form over the vulvar erosions and ulcerations. The *symptoms* associated with this condition are—more or less pain; enlargement and tenderness of the inguinal glands, which may even advance to suppuration; malaise and pyrexia of varying degrees. Not infrequently there is an associated septic disease of the urethra and bladder. The *diagnosis* is made by direct inspection of the parts. The *prognosis* varies according to the nature of the inflammatory process, but is always doubtful. The *treatment* is the same as that for similar conditions of the vaginal mucosa.

(2) **Endokolpitis (Elytritis).**—Septic inflammation of the vaginal mucosa may be *catarrhal* (*endocolpitis catarrhalis*), *phlegmonous* or *ulcerative* (*endocolpitis gangrænosa*), or *diphtheric* (*endocolpitis diphtheritica*). In the first form the vaginal mucosa is red and angry-looking; dry and glazed at first, within twenty-four or thirty-six hours it becomes bathed in an irritating creamy leukorrhea. In the *phlegmonous* variety abscesses of varying size form in the vaginal walls, usually low down near the vulvar orifice, although occasionally they may be found in the upper third of the vagina, in which case the gravity of the condition is materially increased. These abscesses run a rapid course, and either open spontaneously or must be evacuated. They may become gangrenous, and, as in the vulva, cause extensive sloughing of the parts, together with more or less profound general toxemia. In the diphtheric variety gray patches of closely adherent pseudomembrane form upon the ulcers and abrasions: the patches, at first isolated,

soon coalesce, and in these cases, which are almost invariably fatal, the general symptoms are very grave. The patient may fall into a state of collapse from the very beginning, with subnormal temperature and extremely rapid, feeble pulse. The lochia are very offensive or altogether suppressed. The *diagnosis* is made by inspection through a speculum. The *prognosis* is doubtful at the best, and very grave in the diphtheric variety. The *treatment* consists primarily in the observance of thorough asepsis of the genitalia by frequent vaginal douches of warm mercuric-chlorid solution (1 : 2000), followed by the introduction of a vaginal suppository of iodoform, 20–30 grains; or the entire vagina may be sprayed with an ethereal solution of iodoform. The vagina may first be painted with a weak solution of silver nitrate, 10 grains to the ounce, after which the iodoform, or a mixture of equal parts of iodoform and boracic acid, may be introduced and repeated daily. Cold compresses over the vulva may considerably ameliorate the symptoms. In the phlegmonous form the abscesses must be promptly evacuated and the resulting ulcers treated with mild caustics, as weak carbolic-acid solutions, and then dusted with powdered zinc oxid or zinc oleate. Garrigues recommends for this purpose equal parts of zinc chlorid and water, but such an application is exceedingly painful and therefore objectionable. In the graver cases it may be well to curet the ulcerations before applying the caustics and alteratives. *Diphtheric* patches must be thoroughly cleansed, the pseudomembrane removed, and the bases cauterized with a strong solution of mercuric chlorid (1 : 500 or 1000), zinc chlorid, or silver nitrate (40–60 grains to the ounce). The general treatment is the same as for all forms of puerperal sepsis.

(3) **Endometritis.** — As before, we find the following varieties of septic inflammation of the endometrium in the puerpera: catarrhal or suppurative (*endometritis catarrhalis*), phlegmonous or ulcerative (*endometritis purulenta*), gangrenous (*endometritis gangrænosa*), and diphtheric (*endometritis*

diphtheritica). Endometritis may exist as a distinct condition, originating primarily at the placental site in the decomposition of retained portions of secundines; it may arise secondarily to a vaginitis as a direct extension of the morbid process from continuity of tissues, or to a metritis of lymphatic or phlebitic origin, the endometrial disease again occurring from extension of the disease from contiguity of tissue. In every case of puerperal metritis there is of necessity a coexistent puerperal endometritis. The *symptoms* of the disease seldom manifest themselves prior to the third day of the puerperium, and often not for many days after this period. The patient may have passed safely through an apparently normal convalescence before any pathologic symptoms supervene. Especially is this true in those cases in which the disease arises as a consequence of direct infection of the endometrium from without, as after the introduction of an unclean instrument or hand. When, as usual, it follows in the course of an ordinary sapremia, the symptoms appear shortly after labor and run a course of varying severity. There may at first be noted a distinct chill or chilly sensation, or this may be entirely absent. The temperature is only moderately elevated—99°–100° F.—but with each successive day there occurs a more marked elevation, until it is not at all uncommon to find the thermometer registering 103°, 104°, or 105° F. Coincident with this elevation of temperature there is a corresponding decrease in the quantity of the lochia, which are also radically altered in quality. They become now more or less grumous in character and decidedly fetid. The pulse is rapid, the expression anxious, the skin more or less muddy, and the patient complains of a feeling of malaise. Physical exploration reveals an enlarged and boggy uterus, slighty sensitive to pressure, indicating a certain amount of metritis. Later in the disease, when there has occurred an extension to the parametrium, there will be noted, in addition, more or less abdominal disten-

tion. The bowels are constipated, the tongue is coated, the appetite lost, and the breath fetid. In those cases in which a rapid necrosis of the endometrium occurs, the lochia, at first partially suppressed, become very profuse and contain shreds of the decomposing tissue. The *pathology* of septic endometritis varies according to the intensity of the inflammatory process. In the simple catarrhal cases the greatest changes are to be noted at the placental site. Surrounding this portion of the endometrium there is thrown out a zone of cellular infiltration whereby the pathogenic microbes are largely limited in their action. Within this zone there occurs more or less necrosis of the placental débris, while around it the endometrium is congested, reddened, and softened. When this limiting zone of cellular infiltration fails to form, the graver varieties of septic endometritis are developed: the entire endometrium becomes infected, and a rapid disintegration of the decidual tissue ensues. Small ulcers may be formed here and there, and these may or may not coalesce (*endometritis purulenta*). The whole endometrium may quickly be transformed into a grayish-yellow pultaceous mass dotted with patches of necrosed tissue (*endometritis gangrænosa*): in some of these grave cases a thick membranous formation occurs, deeply penetrating into the muscular tissue of the uterine walls and filled with pathogenic microbes: this is the so-called *diphtheric endometritis.* The uterine cavity when split open reveals an angry multicolored surface covered with a purulent exudate and revealing at points masses of necrosed tissue. These cases prove very rapidly fatal as a rule, the patient often being comatose from the beginning and having a subnormal temperature. The membranous tissue is of a whiter color than the membrane of diphtheria, and very generally does not contain the Klebs-Löffler bacillus. The *diagnosis* of puerperal endometritis is easy. The *prognosis* is doubtful, and in the gangrenous and diphtheric forms very grave. *Treatment.*—When the endometrium has once

become infected the only course to pursue is thorough cleansing and disinfection of the uterine cavity, which may be accomplished according to the method already suggested in the treatment of puerperal sapremia. In addition to this, ulcerations, when present, must be cauterized with a 50 per cent. solution of zinc chlorid, silver nitrate (5j to the ounce), or a 1 : 500 solution of mercuric chlorid; diphtheric membranes must be removed, the resulting ulcerations cauterized, and the uterine cavity packed with iodoform-gauze. The patient's strength must be maintained by full doses of stimulants, quinin, and tonics, and by a rich and nutritious diet.

(4) **Endosalpingitis.**—Inflammation of the mucosa of the Fallopian tubes during the puerperium is always secondary to a puerperal endometritis. It is quite a common condition, especially after the minor grades of catarrhal septic endometritis. Beginning as a catarrhal inflammation, it is not long before a purulent secretion is established (*endosalpingitis purulenta*), and this, leaking outward through the fimbriated extremity of the tube, induces repeated attacks of localized pelvic peritonitis. Bands of adhesion result, the distal extremity of the tube becomes occluded, and an acute pyosalpinx is formed (*puerperal* or *septic pyosalpingitis*). The patient is an intense sufferer. Her pain is localized in and around the affected appendage, and is acute, lancinating, and paroxysmal. She is compelled to assume the dorsal decubitus, with her knees drawn up. The abdomen is tense, and a certain amount of tympany exists. The bowels may be constipated throughout, or alternate spells of constipation and diarrhea may characterize the attack. The pulse is rapid and wiry, the temperature hectic in type, and chilly sensations or actual rigors may be noted. A pelvic examination will reveal a fulness in the vaginal fornix of the affected side, while the uterus will be found displaced to the opposite side and partially immobilized. Pressure in the region of the broad ligament will elicit tenderness. The *diagnosis* of this variety of puerperal sepsis is plain. The *prognosis* is

good if prompt and appropriate treatment be instituted. *Treatment.*—In these cases abdominal section with enucleation of the affected tube will alone effect a cure. The appendage of the opposite side may or may not be removed, according to the exigencies of the case.

(3) Puerperal (Septic) Urethritis, Cystitis, Ureteritis, and Pyelitis.—A grave and, fortunately, rare variety of puerperal sepsis is that involving the genitourinary system. The disease begins as a urethritis that quickly extends to the bladder. The cystitis thus produced may be checked, or there may occur a further extension of the disease to one or both ureters, with ultimate involvement of the renal pelves, as was first demonstrated by Kaltenbach. The usual cause of this grave variety of sepsis is the careless introduction of an unclean catheter into the urethra, either by the physician himself or more usually by the nurse. Mann of Buffalo and Skene of New York have called attention to a form of puerperal ureteritis resulting from injuries during labor, especially from pressure exerted by the fetal head or by the forceps during the pendulum movement of that instrument. This traumatic variety of ureteritis is quite distinct from the septic condition now under consideration. The local *symptoms* of the septic variety are those of an aggravated cystitis—frequent micturition with burning and tenesmus, and the passage of bloody and scanty urine, alkaline in reaction and containing pus-corpuscles and shreds of mucus. Unless prompt treatment be instituted, an extension will occur to the ureters. The temperature then becomes high—103°–105° F. There is extreme prostration; the pulse is rapid, feeble, and at times irregular; the skin is cold and clammy. The mind may be clear, or there may be periods of mild delirium. There is an incessant desire to micturate, which is a most distressing symptom in all the cases. The anemia is profound; the condition of the bowels varies, there being present in many cases a troublesome diarrhea associated with more or less abdom-

inal distention. An examination of the urine that is voided, which is always scanty in amount (as low as 6 ounces in twenty-four hours—Mann), shows it to be acid in reaction, usually of low specific gravity, and to contain a sediment composed of uric acid, urates, pus in large quantities, blood-corpuscles, and vesical, and it may be renal, epithelium. In the case of ureteral involvement there will not be much mucus in the urine, while if the disease be mainly localized in the bladder much mucus and an ammoniacal urine is the rule. Albumin is generally absent, or present only in minute quantities. In these cases of ureteral involvement physical exploration will reveal, in addition to the ordinary signs of cystitis, extreme tenderness along the course of the ureters, associated with considerable pain in the loins. In order to elicit this symptom palpation of the ureters must be practised according to the pelvic method recommended by Kelly and Mann, or by Tourneur's abdominal method. The pelvic method is thus described by Mann:[1] "The finger is carried along the anterior vaginal wall upward and outward near the brim of the pelvis to one side of the uterus. It is then pressed forward, stroking the pelvic wall and carefully feeling for a cord-like body under it. Sometimes a bimanual examination will greatly aid in discovering the ureters." When the inflamed structure is touched there is at once elicited marked tenderness and an almost uncontrollable desire to micturate. In very marked cases and in inexperienced hands the sufferings of the patient may contraindicate prolonged efforts at ureteral palpation. *Tourneur's method of abdominal palpation of the ureters* is more difficult. Tourneur claims that the ureter can be found at the level of the superior strait, at one-third the distance that separates the anterior superior spines of the ilium. In order to detect it, however, the abdominal walls must be relaxed, the bowels empty, and the patient resting in the recumbent posture on a hard table with the knees drawn up.

[1] *Gynecological Transactions*, vol. xix.

The *pathology* of this form of puerperal sepsis consists essentially in a catarrhal inflammation of the mucous lining of the urethra, bladder, and ureters. There is considerable swelling of the tissues, with some desquamation of the epithelial lining, at times terminating in suppuration and ulceration; there may result more or less permanent thickening of the inflamed tissues. It is a curious fact that the left ureter is more frequently affected. The *diagnosis* of septic involvement of the urinary system is made by attention to the symptoms, by physical exploration, and by a chemical and microscopic examination of the urine. The *prognosis* is always grave. *Treatment* consists in both local and constitutional medication. In the first place, the bladder must be kept in as aseptic a condition as possible. This is best accomplished by repeated (two or three times daily) irrigation with a saturated boric-acid solution or a weak solution of creolin (½ of 1 per cent.) or of mercuric chlorid (1 : 8000), the boric acid being preferable because of the lesser degree of pain produced. The quality of the urine may be altered by the administration of boric or benzoic acid or of salol in full doses (as shown by an odor of carbolic acid in the urine). Free stimulation is essential, as in the other forms of sepsis, and, in addition, full doses of tonics (quinin, iron, and strychnin) must be exhibited. Convalescence is protracted and must be treated on general principles. Good hygiene and diet, mental and physical rest, and change of climate are essential.

4. Puerperal (Septic) Proctitis.—Septic inflammation of the rectum is invariably the result of direct infection through the agency of an unclean nozzle of a syringe. It is an exceedingly rare complication of the puerperium, and when encountered almost invariably terminates fatally within a very short time. It is usually diphtheric in nature, although it may be purely catarrhal, and in these cases recovery may follow. The symptoms are those of profound septicemia, without any of the local manifestations of that

condition. In the virulent cases the patient may succumb very promptly, and the true condition may be discovered only at the autopsy. The *treatment* consists in disinfection of the bowel as far as possible by injections of hot sterilized water or water containing boric acid. Diphtheric membranes must be removed, and the ulcerated surfaces cauterized with silver nitrate or chromic acid. The usual constitutional treatment is indicated.

B. Autogenetic Puerperal Sepsis (Autoinfection).—The possibility of self-infection by the puerperal woman has been disputed ever since the era of antisepsis was inaugurated. It is now generally admitted that in very rare instances a variety of true puerperal sepsis may arise irrespective of any immediate infection from without. F. Ahlfeld concludes that usually in these cases there exists a true resorption-fever from retention of the infectious childbed secretions, the poisonous materials being taken into the system mainly through the lymphatics of the uterine mucosa—especially those at or near the placental site—and of the vagina. Such a morbid process may arise in a case in which no previous examination has been made, the labor having been conducted according to the method advocated by Leopold and Spörlin. For the most part these cases run an uneventful course, characterized by a moderate elevation of temperature and symptoms of comparative unimportance, but a fatal termination is not at all improbable; hence they should excite as much apprehension and receive as careful attention as the true cases of heterogenetic infection.

There is another class of so-called autoinfection, arising from the rupture of an old pus-tube during labor or the absorption of germs from a latent gonorrhea, both having escaped notice. This is a true heterogenetic infection, and these cases cannot properly be included under the present heading. With much more justice, however, may here be grouped those very rare cases of puerperal peritonitis arising from a pressure-necrosis of a fibromatous or myoma-

tous growth, or of the muscular walls of a moderately contracted pelvis. In these cases there is manifestly no infection from without, and yet the patient exhibits all the symptoms of a true septic process, and must be subjected to the same course of treatment.

5. Puerperal Insanity.

Insanity occurring during the puerperium may manifest itself at any time from childbirth to the end of the process of involution. The frequency of this accident is greater than one would at first thought imagine. It has been proved from careful statistics made on the subject that 1 parturient woman in every 400 will become insane, or in a population the size of that of Philadelphia, where from 30,000 to 35,000 children are born annually, from 75 to 80 of the women will suffer. The most common period for the disease to manifest itself is from the third to the tenth day, and, in contradistinction to gestational insanity, which is usually melancholic in type, puerperal insanity is most generally maniacal. When appearing later in the puerperium, at the sixth or seventh week, it has been designated *lactational insanity*, and at this period the type again reverts to that of the gestational form, the melancholic, with strong suicidal and homicidal tendencies. *Etiology*.—Much has been written as to the causation of puerperal insanity. In brief, it may be stated that there are five chief etiologic factors—heredity, primiparity, anxiety, dystocia, and septic infection. In a large percentage of the reported cases an hereditary taint can be detected, insanity having existed either in some member of the immediate family of the patient or in some of the near ancestors. If true insanity cannot be discovered in the family, it is not uncommon to find a strong neurotic tendency, as manifested by the history of chorea, epilepsy, or marked hysteric manifestations. The frequency of insanity in primiparæ may be explained largely by the overwrought nervous systems of these women, who are passing

through an entirely unique experience, and who are exposed to a much more intense nervous and physical strain than are multiparæ. Anxiety especially plays a powerful etiologic rôle in the production of insanity in those women who are illegitimately pregnant and who dread the results of their indiscretion. A prolonged and difficult labor, especially if instrumental, adds materially to the nervous strain to which the patient is subjected, and, when acting on those in whom the nervous element predominates, may be sufficient to destroy the mental equilibrium. Finally, the influence of septic infection, either autogenetic, as that arising from renal insufficiency, or heterogenetic—true puerperal sepsis—in the development of puerperal insanity can no longer be overlooked. The literature of this subject is daily increasing, and there have been reported a large number of cases attributable to sepsis alone. Extreme fright, intense anemia, and profound general depression are also noted as predisposing to the condition. *Symptoms.*—The disease commonly appears with alarming abruptness. Without warning the patient becomes maniacal or wildly delirious, and suffers from the most peculiar hallucinations. A homicidal tendency is often manifested, the objects of her hatred not infrequently being those in whom her dearest affections are centered. Infanticide is a very common crime among these unfortunate women. With this mental aberration there are certain physical abnormalities. It is not uncommon to note a marked elevation of temperature, and there is often a strong aversion to food of all kinds, so much so that forced feeding through a stomach-tube introduced through the nose, or injections of nutritive enemata, may be necessitated. The mania may become so violent as to greatly exhaust the vital powers of the patient and result in an early fatal termination. The melancholic cases are more treacherous. A surprising amount of cunning will be manifested by these patients in order to deceive or elude the vigilance of their attendants, and the most disastrous results to the

patient herself and to others may attend the slightest relaxation on their part. A suicidal tendency is especially to be suspected in these cases. The *diagnosis* of puerperal insanity should not be difficult. Fortunately, the *prognosis* is not grave. From 65 to 75 per cent. of the cases eventually make a complete recovery. The remaining 25 to 35 per cent. either die from exhaustion induced by the violence of the attack or from septicemia, or remain permanently insane. *Treatment.*—The most satisfactory management of these women is to be found in a private hospital or asylum, where more thorough isolation can be secured, a closer supervision of the patient maintained, and injury to herself and others prevented. The indications are to control mental disturbance, to combat septic processes, and to nourish the patient. The nerve-sedatives in the form of the bromids in full doses, chloral hydrate, hyoscyamin, hyoscin, and sulphonal, are of the greatest value in these cases. Vaginal and uterine disinfection and the administration of salines in full doses are required in cases of suspected septic infection. If any degree of hyperpyrexia exist, it may be controlled by cold sponge-bathing, the abdominal coil, and the ice-cap. Antipyretics, except quinin, may be of service in moderate doses. Stimulants of all kinds are contraindicated, but tonics, as iron, arsenic, and the hypophosphites, supplemented by a nutritious diet, are essential. Proper hygiene must be insisted upon, and change of scene and travel with an attendant (in the melancholic cases) may aid materially in effecting a cure. In no case should the woman be permitted to nurse her child; it must be fed by a wet-nurse or placed upon a course of artificial feeding.

6. Subinvolution of the Uterus.

By this term is indicated a condition of imperfect or incomplete contraction of the womb after delivery, whereby that organ fails to regain its normal size, and remains

heavy and over-voluminous. The process of involution has been fully described in a previous section, and the normal size of the uterus at the successive periods of the puerperium has been noted. It will be remembered that the reduction in the size of the organ is accomplished by a process of fatty degeneration to which the hypertrophied muscular fibers of the uterus are subjected because of their diminished blood-supply. Now, it may readily be conceived that any condition that will arrest the process of degeneration will prevent the return of the uterus to its primary condition. This arrest of involution is brought about entirely by changes in the circulation of the uterus and its immediate vicinity: in other words, it is *congestive* in origin, and this congestion may be *active* or *passive*, the increased blood-supply in either case sufficing to nourish the excess of uterine tissue and thereby prevent its removal by fatty degeneration and absorption. The *causes* of *active* congestion of the puerperal uterus are various: it may result from an acute inflammation, as that following extensive laceration of the cervical tissues and vaginal vault; it may follow an acute anteflexion or retroflexion of the heavy organ, with arrest of the circulation at the angle of flexion; there may be retained in the uterine cavity large fragments of placental or decidual tissue; or the marital relation may have been resumed at a period too early after parturition. *Passive* congestion of the uterus and of all the pelvic viscera may be induced by chronic cardiac, pulmonary, or hepatic disease; by the presence of pelvic tumors, as uterine fibroids or mucous polypi, ovarian cystomata, bony exostoses or osteosarcomata; by overloading of the rectum; by extreme distention of the bladder; by pelvic inflammatory conditions, either old or of recent septic origin; by too early resumption of the active duties of life. *Symptoms and Diagnosis.*—In every case in which there fails to occur a proper involution of the organ there ensues a train of symptoms which are highly suggestive if

not diagnostic. The patient complains of weight in the pelvis; the lochial discharges remain profuse and bloody, or, having become mainly serous, there is a return of the bloody flow; there is more or less pain and tenderness on manipulation of the abdomen, with backache and reflex manifestations; and if a displacement of the uterus exists, there will supervene the accompanying pressure-symptoms—irritability of the bladder and increasing constipation. An absolute diagnosis of the condition will be afforded by a bimanual examination. The uterus will be found to be considerably above the normal size for the period of involution. It is large, soft, and boggy, and more or less tender on pressure. The cause of the condition, if neoplasm, displacement, or laceration, will also be revealed by this examination. The *prognosis* is good as regards life. The condition may require a prolonged course of treatment before an absolute cure is obtained. The *treatment* will vary according to the etiology of the case. If it be the result of cervical or vaginal laceration, an appropriate trachelorrhaphy or kolporrhaphy will result in a cure. Retained fragments of placental and decidual tissue, associated with a grumous and offensive discharge, require thorough curettage and disinfection of the uterine cavity, after which involution will proceed normally. A chronic systemic condition must be combated according to general methods. A pelvic tumor may be removed after abdominal section, or, if it be a small uterine fibroid, an attempt to reduce its size and limit its further growth may be made by the internal administration of ammonium chlorid in 10-grain doses three or four times daily, or of ergot in doses of from 15 to 30 minims every four hours. Constipation must be corrected, the action of the kidneys maintained, and the bladder evacuated at regular intervals. Gentle daily massage of the uterus may hasten involution. The excess of lochia necessitates hot vaginal douching (110° to 115° F.) night and morning.

7. Superinvolution (Hyperinvolution) of the Uterus.

Very rarely the reverse of the foregoing process has been noted, and the involution, instead of being arrested when the uterus has attained its normal dimensions, is continued beyond that period; in other words, there occurs a fatty degeneration not only of the excess, but of the true uterine tissue also. The uterus in these cases of over-involution practically undergoes a process of atrophy, and may become quite small or even almost entirely disappear. Just what is the true etiology of this remarkable occurrence it is difficult to say. It is probably not the result of a special trophoneurotic action, the effect of suckling on the pelvic organs, as has been claimed by some observers. It is far more reasonable to consider it a direct result of the profound general anemia noted in some women, and that may or may not be associated with protracted lactation. The deficient blood-supply of the body consequent upon the drain through the functionating mammæ is quite sufficient to account for the process. The *symptoms* of the condition are generally obscure. There may be some vague pelvic manifestations; menstruation may fail to return at the usual period after childbirth, and this may excite apprehension; or the condition may accidentally be discovered during a bimanual examination, which will reveal an unusual smallness of the uterus with or without concomitant pelvic abnormalities. The *treatment* must consist in the weaning of the child, the administration of full doses of tonics, notably strychnin, iron, arsenic, and a full and nutritious diet. Good hygiene and change of air and occupation are of service.

8. Intestinal Abnormalities.

(1) **Constipation.**—In the majority of cases, after the bowels have been opened on the evening of the second or the morning of the third day of the puerperium, the daily routine action is reestablished and the woman

resumes her normal habit. It not infrequently happens, however, that an annoying constipation persists, and in these cases much skill must be exhibited in securing a moderate daily evacuation of the bowels without resorting to hypercatharsis. If possible, this should be secured by a suitable diet: this means failing, a Seidlitz powder, half a bottle of magnesium citrate at bedtime, or a pill of aloin, strychnin, and belladonna may be administered. With the cultivation of the habit of daily evacuation of the bowels most of the unpleasant sequences of this condition may be averted.

(2) **Acute Tympanites.**—An annoying and at times an alarming condition may follow a sudden paralysis of the intestinal walls in the puerperal woman. This is encountered only in neurotic individuals, and in some instances to an unprecedented extent. The abdominal walls become immensely distended, and true orthopnea may be induced by the extreme upward displacement of the diaphragm. The peristaltic movement is abolished, and absolute constipation, with consequent vomiting, hiccoughing, and other symptoms of obstruction of the bowels, supervenes. *Treatment* comprises the administration of nerve-sedatives, the application of a firm abdominal binder, and frequently repeated injections of strychnin sulphate. A bowel-movement may be hastened by enemata of turpentine and milk of asafetida, and by mild cathartics given by the mouth. In extreme cases only will the use of the rectal tube or resort to intestinal puncture be necessitated.

(3) **Hemorrhoids.**—Not infrequently a most annoying hemorrhoidal condition will persist after parturition, or perhaps it may manifest itself only at this time. The pain induced by these varices is most intense, and if the tenesmus be great the tumors may attain considerable bulk. Clotting often occurs, and ulceration or gangrene of the occluded vessels may follow. In the early stages of this painful condition rectal injections of cold water or the in-

troduction of a suppository containing opium, belladonna, and tannic acid may give much relief. Lotions of hot lead-water and laudanum are beneficial, and Barker and Lusk emphasize the curative value of a pill of aloin, ½ grain, night and morning. Should strangulation occur, ligation and excision of the hemorrhoids become imperative.

9. Incontinence of Urine.

The involuntary escape of urine, either immediately after the birth of the child or within a few days, should excite the apprehension of the accoucheur, and an immediate examination should be instituted as to its cause. If the symptom be accompanied by intense cramp-like pains in the lower abdominal region, and the urine escape a few drops at a time or with an occasional slight spurt, the so-called *incontinence of retention* should be suspected. In this case exploration will reveal a tumor in the median line of the abdomen extending up as a dome from the symphysis pubis. Percussion over the distention elicits absolute dulness, and the introduction of an aseptic catheter will be followed by the escape of a large amount (a quart or more) of urine. If the escape of urine be unattended with pain and occur subsequently to a tedious or instrumental labor, a vesicovaginal fistula from pressure-necrosis or direct traumatism should be looked for. If this be discovered and it be of but minute size, the natural reparative powers of nature may effect a cure: if not, the application of a caustic, as chromic or nitric acid, the acid nitrate of mercury, or a strong solution of silver nitrate, may produce sufficient granulation to close the orifice. In more extensive destruction of tissue some plastic operation will be necessitated. Rarely (about once in 2000 cases) thorough physical exploration fails to detect any adequate cause for the escape of the urine, and in these cases the only plausible explanation is a pressure-paralysis of the urethra and the vesical sphincter. The sphincteric action may gradually

reassert itself, or the condition may remain permanent. Strychnin in full doses, mild faradism of the urethra, and gentle massage may aid in effecting a cure.

10. Retention of Urine.

Much more common than the foregoing is the tendency to urinary retention after labor. To a certain extent this is to be expected for a few hours, owing to the increased capacity of the bladder after reduction of the uterine bulk and the removal of the action of the abdominal muscles. It is possible, however, for a true obstruction to the flow of urine to result from traumatism of the parts during the passage of the child's head. This may consist merely in a temporary swelling of the urethral walls, with a serous exudate, or there may have occurred an unwonted distention and twisting of the caliber of the urethra. In either case a delay of not more than eighteen hours is justifiable. If at the expiration of this period of time the urine have not been voided, an aseptic catheter must be introduced and the bladder evacuated. In women of a strongly neurotic temperament this procedure may necessitate vesical catheterism for days or even weeks, the bladder-walls apparently becoming apathetic and utterly incapacitated for performing their customary function. The use of strychnin and nerve-sedatives in full doses will largely overcome this hysteric manifestation. It is also advisable in these cases to permit the patient to assume the sitting posture, a simple change of position effecting a cure. Not infrequently the sound of running water will be followed by a relaxation of the sphincter and evacuation of the bladder.

11. Pathology of the Mammæ.

(1) **Inversion of the Nipple.**—In many young girls a congenital defect of the nipple will be noted. This usually consists in a depression or flattening of the nipple, or an actual inversion whereby there exists a cavity (*crater-nipple*)

instead of a protuberance. Such a defect as this constitutes an absolute impediment to lactation, and, when discovered, efforts should be made to remedy the condition. The close reflex relationship existing between the mammary glands and the pelvic viscera must be constantly borne in mind, and this will contraindicate any active manipulation of the gland prior to the last three or four weeks of gestation. During this final stage, however, gentle traction upon the nipple by the fingers of the physician, the nurse, or the patient herself may be advantageously practised daily. If not successful, more powerful suction may be substituted through the agency of a breast-pump. Even this fails in some cases, and the infant must then be made to nurse through an artificial nipple held over the breast, or it must be given to the care of a wet-nurse or raised upon the bottle.

(2) **Fissured Nipples.**—The constant alternation of moisture and dryness exposes the nipples to the danger of chafing, and in many cases deep and most exquisitely tender fissures develop. There are very few, if any, parturient women who have not suffered to varying degrees from this condition. Aside from the suffering inflicted, the especial menace to the patient lies in the entrance of pathogenic germs that may at any time institute an active inflammation of the glandular substance. The *treatment* is mainly prophylactic. During the later weeks of gestation a certain amount of hardening of the nipples may be secured by exposing them daily for from twenty to thirty minutes to the action of the atmosphere. It has been found that after the birth of the child the frequent bathing of the nipples with some antiseptic solution will very effectively diminish the frequency of chafing. Most commonly employed for this purpose is a saturated solution of boric acid. To use this with the greatest satisfaction, not only should the nipple be cleansed with it after each nursing, but the baby's mouth also both before and after feeding. The nipple should be well dried, a drop or two of olive oil rubbed in, and a small

compress of lint saturated with the boric-acid solution placed over it. Before the next nursing the oil must be removed and the nipple bathed in the boric-acid solution. This procedure should be adopted at each nursing. The use of astringent remedies is to be deprecated. The child should not be permitted to sleep with the nipple in its mouth, as this prolonged maceration increases greatly the tendency to fissuring. If, notwithstanding these measures or because of their neglect, fissuring result, the pain attendant upon the condition and the imminent danger of septic infection necessitate an energetic course of treatment. In all cases in which the fissuring is deep and active ulceration is present it is well to keep the child from the nipple until the soreness disappears. In the mean time applications of ichthyol in lanolin or glycerin, or of aristol in liquid vaselin (aristol 5j to 5v of the vaselin), or of an ointment of bismuth subnitrate and castor oil, 1 dram of each (Hirst), should be made at frequent intervals. Among the other local remedies that have been employed with considerable satisfaction may be mentioned the compound tincture of benzoin and a 4 to 8 per cent. solution of silver nitrate, of which a few drops are applied after each nursing (if the child be allowed the breast), or three or four times daily if the breast be not used. The milk should be drawn at regular intervals when the child is not given the nipple. In these ulcerated cases Lepage recommends bathing the sore with the following solution: Red iodid of mercury, 10–20 cgm. (2–4 gr.); spirit of wine, 50 gm. (1½ oz.); glycerin and distilled water, each 700 gm. (1 pint). He claims that the pain is greatly diminished by this course of treatment. Finally, if the child nurse from the breast, it should always do so through a large white-rubber nipple-shield, which can be more readily cleansed than the ordinary small rubber shield. This must be kept absolutely clean by immersing it between-times in a saturated solution of boric acid.

(3) **Mastitis (Mammary Lymphangitis; Galactophor-**

itis; Mammitis).—Inflammation of the mammary glands is, as a rule, an absolutely avoidable complication of the puerperium. When the flow of milk is established there naturally ensues an intense engorgement of the glandular substance, and any lack of attention on the part of the accoucheur at this critical period might readily result in the so-called *caking of the breasts.* In this condition there occurs an accumulation of the milk in the galactophorous ducts, and the attendant congestion in a small proportion of cases acts as a predisposing factor in the production of a parenchymatous inflammation of the mammæ. This, however, is not the common mode of development of a mastitis. In the vast majority of cases the condition may be traced directly to a septic infection of the gland following fissuring of the nipple, as already mentioned. Inflammation of the mammæ should, therefore, be regarded as one variety of heterogenetic puerperal sepsis, the germs entering the system independently of the genitourinary tract. In a certain proportion of cases direct traumatism is the cause. The *pathology* of mastitis consists essentially in an acute inflammation of the cellular tissue of the gland which may or may not terminate in suppuration, the latter condition being described under the terms *mammary abscess* and *gathered breast.* The inflammatory process may be located immediately under and around the nipple, producing a superficial form of mastitis—the subcutaneous variety; more commonly it involves the deeper structures, and generally to one or the other side of the gland below its transverse diameter, while in rather rare instances the cellular tissue beneath the true gland-structure becomes inflamed through lymphatic infection—a *postmammary* or *submammary* inflammation with or without resultant abscess.

The *symptoms* of mastitis are acute pain, inflammation, and slight reddening of the surface; induration of the affected lobule or lobules of the gland; malaise; elevation of temperature, with one or repeated rigors; loss of

appetite; rapid pulse; cephalalgia; and flushing of the face. Manipulation of the gland elicits marked tenderness, and nursing is interfered with in consequence in many cases. These symptoms develop gradually in a breast the seat of a fissured nipple or of a parenchymatous engorgement with occlusion of the milk-ducts, and are, accordingly, most frequent during the early days of the puerperium. The tendency is to resolution or suppuration. In the favorable cases an appropriate course of treatment is followed by a steady amelioration of the symptoms until the breast has resumed its original healthy condition and a normal lactation is inaugurated. The symptoms attendant upon suppuration—which is most common in the third or fourth week of the puerperium—are as follows: The inflammatory manifestations rapidly increase in severity; the pain loses its acute, lancinating character, and becomes duller and more throbbing, as in an abscess elsewhere; a distinct rigor or repeated chills usher in the pus-formation, and the fever assumes the hectic type. Palpation of the inflamed nodule then shows distinct softening of the indurated portions, and in many instances fluctuation. The surface is soft and edematous, and a characteristic glazing and lividity of the skin are noted. The abscess shows a tendency to point upon the cutaneous surface, and spontaneous rupture will generally follow if the surgeon's knife do not terminate the process. In these neglected cases the pus shows a marked tendency to burrow and invade the healthier portion of the gland. The adjacent lobules may become affected, and very extensive glandular destruction follow. Sinuous tracts leading to areas around the periphery of the gland, and not infrequently to remote regions, are unpleasant complications of this condition. When the abscess is situated deeply in the alveolar tissue beneath the gland and just above the pectoral muscles, the condition known as *postmammary* (*submammary*) *abscess* results. This

is accompanied by a very characteristic train of symptoms. The pain is not localized in any one spot, but is general throughout the gland, and is increased by the slightest movement of the arm of the affected side; there is no marked change in the macroscopic appearance of the gland other than a tendency to general edema and a protrusion of the whole breast from the subjacent structures, so that it assumes a prominence that is both striking and suggestive. The accumulation of pus in this case may become excessive, and the burrowing a much more marked feature than in suppuration of the gland itself.

Diagnosis.—Mammary inflammation and abscess should not be difficult to recognize. In the earliest stages of pus-formation the change in the color of the skin and that in the consistence of the induration are the most distinctive features, and upon their appearance immediate free incision becomes imperative in order to prevent further destruction of tissue and extensive burrowing of pus. The *prognosis* as regards life is good. In neglected cases the utility of the gland may be permanently destroyed. *Treatment.*—Much good will result in a threatened mastitis by prompt prophylactic treatment. In caking of the breast this will consist in gentle massage of the gland, with oiled fingers, from the periphery to the nipple: the pressure need not be sufficient to forcibly express the milk, but rather to impel it onward in the milk-ducts, so that it will slowly flow from the nipple: this may be further facilitated by the application of the child to the breast, the judicious use of the breast-pump, and the administration of full doses of salines in order to secure free purgation. Nursing may be contraindicated because of the pain thereby produced or on account of the deleterious effect upon the child. The induration may be relieved by hot compresses of lead-water and laudanum, together with an elevation of the entire gland by a closely fitting mammary bandage (Figs. 156, 157), which may consist of a strip of unbleached muslin, three or four inches in breadth

and long enough to encircle the chest, to which are attached two broad upright strips that pass over the breasts and are secured to the transverse band posteriorly. The bandage should be as firmly secured as is consistent with comfort.

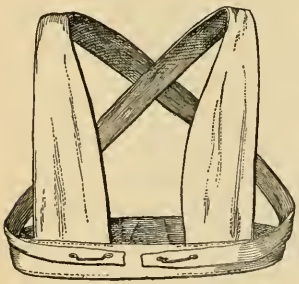

FIG. 156.—Mammary bandage (Auvard).

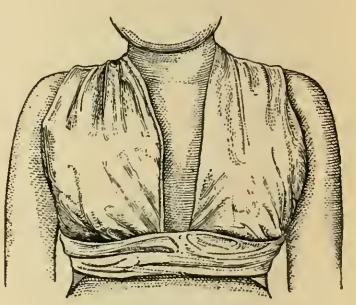

FIG. 157.—Mammary bandage applied (Auvard).

If the nipple be fissured, a very important prophylactic measure in the treatment of mastitis is proper attention to this condition in the manner already suggested. If active inflammation of the gland-substance ensue notwithstanding the foregoing measures, much relief may be afforded, and suppuration may be prevented, by the prompt application of cold, either in the form of lint compresses or by an ice-bag or an ice-coil. These measures may be supplemented by the application of absorbents and counterirritants, as belladonna and ichthyol ointments or pigments of tincture of iodin. The mammary binder firmly applied, so as to exert an equable pressure, is also very essential at this time. When the symptoms indicate inevitable suppuration the process may be hastened by hot poultices, care being observed not to continue these measures too long. Upon the first appearance of pus, free incision of the abscess must be insisted upon, the line of incision corresponding to the radiating course of the milk-ducts in order to avoid the subsequent development of a milk-fistula. The escape of pus should be facilitated by douching the abscess-cavity

with a mild disinfectant solution of carbolic or boracic acid or mercuric chlorid (1 : 4000). A strip of iodoform-gauze may then be introduced for the purpose of drainage, and the wound covered with a layer of moist aseptic lint, and over this a thick layer of cotton, and the breast supported by a tight bandage. In old cases in which extensive burrowing has occurred the fistulous tracts must be opened, carefully cleansed and disinfected, and thoroughly drained. If excessive granulations occur, they may be destroyed by daily applications of the silver-nitrate stick. The constitutional treatment will embrace care in the dietetic regimen, proper hygiene, the avoidance of exposure to damp and cold, absolute rest to the breast, and the administration of tonics (iron, quinin, strychnin) and good food. In the early stages mild opiates may be needed to overcome the pain and the insomnia induced thereby.

(4) **Oligogalactia; Agalactia.**—A deficiency in the quantity of milk in the breasts of a puerperal woman is a not infrequent occurrence. Complete suppression of the mammary function is, however, exceedingly rare. When it is ascertained that the supply of milk is absolutely inadequate to nourish the offspring, every effort must be made to increase both its quantity and its quality. This is best accomplished by the administration of an abundance of rich food, with the addition between meals, at regular intervals, of a glass of malt or milk, and a careful course of massage of the gland, either with or without galvanism. Tonics, especially the iron-preparations, are of much value in these cases. The condition is one most difficult to manage, however, and it is to be regretted that in very many of these cases the progress is from bad to worse until resort must be had to the service of a wet-nurse, to mixed feeding, or to purely artificial feeding. By *mixed feeding* is meant the supplemental employment of a prepared food at intervals between the regular nursings from the breast. If a *wet-nurse* be secured, the physician should always assume the

responsibility of her selection. He must ascertain that she be absolutely healthy, especial investigation being made as to her freedom from syphilitic and tuberculous infection. Her milk should be subjected to a close chemical and physical examination. It has been found that the most suitable milk for this purpose is furnished by a woman who is between twenty and thirty years of age, and who has given birth to a child at about the same time as the woman whose place she is to assume. The breasts must be well developed and the nipples prominent and of proper shape. It is important, as a final consideration, that the woman be of a mild disposition, willing and able to accommodate herself to her surroundings and to subject herself absolutely to the dictates of the accoucheur.

Artificial Feeding.—This is a subject of such magnitude that for its proper consideration not merely pages but an entire volume would be required. All that can be expected here is an indication of the essential features in the process—namely, the choice of a suitable pabulum, the method of administration, and the quantity to be given at any one feeding. Through the investigations of many eminent obstetricians and physicians, it has been definitely ascertained that cows' milk, when modified in the way hereafter to be mentioned, most closely resembles mothers' milk, and is, accordingly, best suited as a substitute for it when for any reason a premature weaning of the child becomes necessary. The most essential points of difference are an excess of casein and acidity and a slight deficiency in the sugar of the cows' milk, together with the presence of germs in the latter within a few hours after it is drawn from the udders. While, according to Gautrelet's figures, there is practically the same amount (6 per cent.) of sugar and fat (4 per cent.) in the two, mothers' milk contains about 2 per cent. of casein, while cows' milk contains about 3½ per cent., or almost twice as much, so that the latter is much more indigestible

than the food supplied by the mother. As a necessary consequence, an infant placed upon an unmodified cows' milk would very quickly manifest evidences of malnutrition, or speedily perish from gastrointestinal complications engendered thereby. Bearing these truths in mind, it becomes evident that in order to convert a given sample of cows' milk into one more closely similating the milk from the human breast it will be necessary to dilute it in order to diminish the relative amount of casein, and to add a certain amount of fat and sugar to bring these substances to the proportion normally existing before the dilution was made. At the same time, the germs contained in the cows' milk must be destroyed by some process of sterilization, preferably by Pasteurization, which has been proved efficient for the purpose without exerting any deleterious effect upon the nutritive value of the milk. From such a working-basis various formulæ have been suggested, notable among which may be mentioned those of Meigs, Hirst, Rotch, and Biedert, which are suitable for the various periods of an infant's existence up to the normal time of weaning. The substances employed in the production of these pabula have been cows' milk—either condensed or fresh—lime-water, cream, and maltin. These are to be combined in quantities proportionate to the age and digestive powers of the infant in question, and any formula giving absolute satisfaction at first must be increased in nutritive power every two to four weeks. The famous *Meigs' mixture* consisted of cream (14–16 per cent. fat), 2 ounces; milk, 1 ounce; lime-water, 2 ounces; and sugar-water (milk-sugar, 17¾ drams; water, 1 pint), 3 ounces. This is strongly alkaline in reaction, containing no starch, 3½ per cent. of fat, and 6½ per cent. of sugar. *Biedert's cream-mixture*, which is most suitable for an infant of three months, consists of cream, 1 ounce; milk, 1 ounce; water, 3 ounces; and milk-sugar, 1 dram. This is acid in reaction, contains no starch, not quite 3 per cent. of fat, and almost 4

per cent. of sugar. Its nutritive value is scarcely sufficient. Rotch has suggested numerous formulæ, of which the following may be considered as a type: Cream, ½ ounce; milk and lime-water, each 1 ounce; water, 17½ ounces; milk-sugar, 2 measures. This is the quantity for twenty-four hours, the amount at each feeding varying with the age of the infant. Hirst has had satisfactory results from the following: For the first two weeks of infantile existence he employs a mixture consisting of condensed milk, 1 part; boiled water, 12 parts; cream, 1 part; and lime-water, 1 part. This contains a little less than 1 per cent. casein. It should be given to the infant in suitable quantities every two hours. For the next two weeks he uses a mixture of cows' milk, 4 parts; boiled water, 5 parts; and cream and lime-water, each 1 part. This is relatively poor in sugar; hence he adds to the mixture from 8 to 10 grains of sugar of malt (maltin) after the first month. The child is fed every two and a half hours during the second month. When the child is three months old the formula is altered so as to contain 5 parts of milk and 4 parts of boiled water, and the strength of the mixture is gradually increased in proportion to the growth of the child.

Whatever the substance employed, it must be well sterilized and the bottle and nipple must be chemically clean. It has been found that Pasteurization, while not destructive to spores, will destroy all pathogenic germs without also affecting deleteriously the quality of the milk. The process is as follows: The bottles for a day's (twelve hours') feeding, six in number, are filled with a sufficient quantity of the selected mixture proportionate to the age of the infant. These are stoppered with plugs of cotton-wool, and are then placed in an Arnold sterilizer or other closed receptacle (an ordinary clothes-boiler will answer admirably). Around the bottles boiling water is poured until the fluid in the receptacle has reached the level of the mixture in the bottles. The lid is then firmly secured and the

water allowed to cool. By this method the temperature of the milk is raised to 175° or 180° F.—a temperature sufficiently high to destroy whatever germs may be present. The stoppers are allowed to remain in the bottles until the time of feeding, when the stopper from the bottle to be used is removed and a sterilized nipple applied. The bottles should be provided with necks of sufficient width to permit the introduction of the index finger, and should be rounded at the angles, so that all uncleanness may be removed. They are best washed by a mixture of soap, water, and liquor ammoniæ, and to avoid breaking should be moderately heated before pouring in the boiling water. Before and after using, the rubber nipple should be inverted and well cleansed, and in the intervals between nursings it may be kept in a tumbler containing a solution of boracic acid.

The quantity of food to be given at any one feeding will depend entirely upon the age of the infant. It must be remembered that the capacity of an infant's stomach at birth is very limited—not exceeding one ounce—and that this capacity increases at the rate of one ounce per month until the sixth month of life, and afterward at the rate of half an ounce per month. An appropriate amount of the selected mixture having been placed in the bottle and sterilized in the manner mentioned, the child should be held in the nurse's arm in a recumbent position, and not allowed to consume the food in less than twenty minutes. This will approximate the time required for normal nursing, and such a procedure will prevent the hasty ingestion of large quantities of milk, with the necessary consequence of curdling and gastric disturbance. The child should not be allowed to rest in the crib with the bottle in its hands or on the pillow. By the observance of some such code of rules as the foregoing much unnecessary infant morbidity and mortality may be prevented.

(5) **Polygalactia; Galactorrhea.**—During the first two

or three days of lactation an excessive flow of milk from the engorged breasts is a physiologic phenomenon. In a large number of instances, however, the flow becomes so excessive as to constantly keep the clothing of the patient saturated, and on account of the discomfort thereby produced and the consequent strain upon the constitution it becomes necessary to remove the excess of milk. This is best accomplished by feeding the infant at regular periods, and in the intervals removing the excessive secretion through the agency of the breast-pump or by careful massage. If this condition occur after death of the infant or after the child has been weaned, efforts must be made to dry up the breasts as speedily as possible. For this purpose ergot may be administered internally in small doses (10 minims four times daily), either alone or in combination with potassium iodid, 10 to 20 grains three times daily. Locally, belladonna-ointment should be applied, or, if this prove inefficient, the nipple may be bathed five or six times daily in a 5 per cent. solution of cocain hydrochlorate in equal parts of glycerin and water (Joise). It is claimed that by this procedure suppression of milk will be observed in from two to six days. The danger of idiosyncrasy must be borne in mind during the employment of cocain.

(6) **Galactocele.**—Occasionally there will be noted in the breast of a nursing woman a soft cystic tumor containing a collection of milk, and resulting from occlusion of one or more of the galactophorous ducts. There is generally no pain attendant upon this condition, and no discomfort is induced thereby unless the tumor attain unusual dimensions. It may then become necessary to puncture the cyst, evacuate its contents, and provide suitable drainage until closure of the wound has occurred.

(7) **Tabes Lactealis.**—In the lower classes of society it is not infrequent to find lactation continued until the child is eighteen months or even two or two and a half years old. While such an unusual prolongation of the period of lac-

tation—known as *hyperlactation*—may not be deleterious to mother or child, the reverse is more likely to be true. Very generally under these circumstances the child will wean itself, refusing to take the breast, or weaning will become imperative on account of the manifest disagreement of the milk with the child. Should this not occur, the mother herself may develop marked constitutional symptoms, including a condition of more or less profound anemia, associated with severe neuralgic attacks in the arms and chest, especially marked while the child is at the breast. The *treatment* of this condition is self-evident. Immediate weaning must be insisted upon, and the mother placed upon full doses of tonics, including strychnin, iron, arsenic, and the fats. Her diet must consist of the most nutritious and readily assimilated articles, and, if possible, a change of air and scene must be urged.

VI. PATHOLOGY OF THE NEW-BORN.

1. Prematurity.

In the foregoing pages frequent mention has been made of the untimely termination of a gestation. This may occur at any period from conception up to the full expiration of the normal term of pregnancy, and the time at which the accident occurs will determine the possibility of infantile existence. It is self-evident that a termination of pregnancy prior to the period of fetal viability can have no bearing upon the question in hand: the term *premature* can be applied only to an infant born before its time, but capable of an independent existence for any period, no matter how brief. It has been very conclusively demonstrated that a fetus expelled during the first six months after conception will inevitably perish at the time of delivery. From the sixth month the probability of living steadily increases to term. A fetus, therefore, is said to be *viable* when it has attained

six months of intrauterine existence, although if born precisely at this time the chances are strongly against its survival. The number of infants expelled during the last trimester of pregnancy is enormous, and it is necessary to consider carefully the means of preservation of these feeble lives until the normal degree of vitality have been attained. These means resolve themselves into two—namely, the maintenance of a normal temperature and the administration of a suitable food.

Immediately after birth there occurs a rapid fall of fetal temperature of from 0.86° C. to 1.7° C., largely arising from a dissipation of heat through the agency of the skin. If this be true of a healthy fetus at term, and it become necessary even under the most favorable circumstances to maintain a normal temperature by suitable wraps and

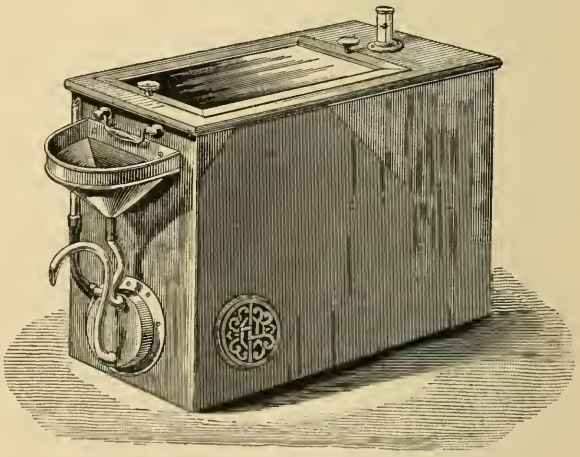

FIG. 158.—Auvard incubator or couveuse.

an environment of proper warmth, it is much more imperative that these immature creatures be afforded the same favorable circumstances, and even to a greater degree. The fetal temperature may best be maintained at the normal

point through the agency of an apparatus technically known as a *couveuse* or *incubator*, various forms of which have been devised. Those most commonly employed in hospitals and maternity-institutions are Tarnier's, Credé's, Auvard's (Figs. 158, 159), and Rotch's. Tarnier's couveuse consists of a box with two compartments, in the upper of which the child is placed, while the lower is filled with warm water, by

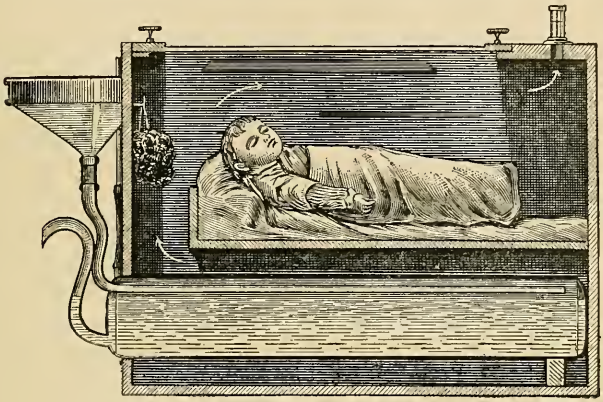

FIG. 159.—Interior view of the Auvard incubator (Fig. 158).

which a uniform temperature of sufficient degree is maintained. Credé's apparatus is in the form of a copper bath-tub with hollow walls and base through which heated water is allowed to flow: the temperature within the tub may thus be maintained at or slightly above blood-heat. The other varieties of incubators are based upon modifications of the foregoing. In the absence of such apparatus a very efficient incubator may be improvised from an ordinary baby-tub or a wooden box. The child may be placed in this, well surrounded with cotton-wool, and a proper temperature maintained by hot bricks or hot-water bottles frequently changed. By such procedure, promptly instituted, many a fetal life will be saved that otherwise would almost inevitably be lost. Especially is this method of treatment

of service in the rearing of children born from four to six weeks before term. Fully 95 per cent. of these infants may be saved. Probably not more than one-fourth of the six and six-and-a-half months' babies survive under the best of care.

The large majority of such infants succumb to the curious condition known as *sclerema neonatorum* (*hide-bound disease; skin-bound disease*)—a disease peculiar to new-born infants, and characterized by an induration of the subcutaneous cellular tissue, especially of the lower extremities, with or without an associated edema of the parts, and by a subnormal temperature. The skin of the front of the chest seems to be exempt from the disease, which is very rarely present at birth, but develops within a few hours. The loss of temperature is usually the first symptom noted, the attention of the nurse or those in attendance being called to the icy coldness of the surface of the child. As low a temperature as 33° C. (92° F.) has been recorded. The skin is hard and dry to the touch, and cannot be pinched up in folds as in a healthy infant; it has a smooth, tense appearance; occasionally pitting on pressure may be noted, as may also more or less rigidity of the joints. A certain amount of icterus is very generally present, the color of the skin varying from yellowish-white to livid or bluish-red. There is also an appreciable loss of cutaneous sensibility, and, in consequence of the changes in the texture of the cutaneous tissue some delay in the falling of the cord is common. Other more or less constant symptoms are dysphagia, digestive disturbances, constipation or diarrhea, slow and feeble pulse (70 to 90 beats per minute), diminished frequency with irregularity of respiration (the rate ranging from 15 to 35 per minute), feeble cry, tonic and clonic convulsions, and a tendency to hemorrhages from the mucous surfaces. As to the etiology of this curious disease but little is known, although various theories have been advanced. From a careful study of the conditions present in these cases it would

seem that the fundamental process in its development is a lack of vitality. This would explain the great prevalence of the disease in immature infants, and this theory is further supported by the fact that when the affection develops in children born at term, it selects those that are constitutionally debilitated and undersized and exposed to unfavorable hygienic surroundings. The disease is also most common in the cold and moist months of the year, when there would naturally be a greater demand upon the heat-producing centers of the body. The actual cause of the cutaneous induration has been very plausibly explained by Hirst as a congelation of the fatty acids of the body, especially the palmitic, a direct consequence of the abnormally low body-temperature. This is especially suggestive when it is remembered that these acids become solid at a comparatively high temperature. The *prognosis* will depend largely upon the ability of the physician and parents to place the child under the most favorable hygienic and dietetic conditions. Sclerema neonatorum is a very grave disease, fully 50 per cent. of the children perishing. The best results are obtained by the employment of the incubator, daily applications of warm oily inunctions (olive oil, camphorated oil, mercurial ointment), the internal administration of alcoholic stimulants or ether in appropriate form and quantity (from one to two drops of either being exhibited in the food), and the feeding of the infant, if it cannot nurse, by the process of *gavage*. This is a term employed to indicate the nourishing of a child by small quantities of the maternal milk introduced into its stomach at regular intervals through a soft-rubber tube. It is a very valuable method of feeding in premature infants who either cannot take the nipple or for whom the mother is unable to furnish food. The infant can very readily be taught to swallow the tube, when the introduction of the milk through a small graduated glass funnel is but a simple matter. The tube must be quickly withdrawn to avoid reflex vomiting.

The best position for the child to occupy is upon its back in the arms of its nurse, with its head slightly elevated. In very young and feeble infants the milk should be administered every hour in quantities not exceeding 1 dram; the brandy may be added to this. Under such a course of treatment from 20 to 50 per cent. of the infants may be saved. The use of the incubator and gavage must be persisted in for varying periods of time dependent upon the age of the infant and its progressive gain in strength and vitality. Usually not less than one or two months of such treatment will be necessary.

2. Asphyxia (Apnœa) Neonatorum (Asphyxia Nascentium).

It is a very common occurrence for a child to be born with the respiratory functions in abeyance: such a child is said to be asphyxiated. If efforts at resuscitation prove ineffectual, it is said to have been *stillborn*. It is probable, as has been very effectually demonstrated by Morrison and others, that the primary cause of this condition is some interference with the fetoplacental circulation, resulting in an intense venous congestion of all the organs of the fetus, with, it may be, here and there ecchymoses or even more extensive effusions of blood. The postmortem examination of infants perishing from this cause would seem to indicate some such origin as this. Evidences of vascular engorgement are to be noted in the right heart, in the cortex of the brain, in the spinal canal, in the lungs and pleuræ, in the liver and spleen, and in the intestinal walls. In those cases in which there have occurred ineffectual efforts at respiration the pulmonary tissue is more intensely congested, and may even be the seat of numerous apoplexies, while the visceral pleura reveals frequent patches of hemorrhagic extravasation. Sections of the lungs are heavy, and when placed in water immediately sink to the bottom of the vessel. A secondary cause of the asphyxia is to be found

in some interference with the respiratory organs themselves or with the respiratory center at the base of the brain. The possible causes of the circulatory obstruction are many. Among those of fetal origin may be quoted syphilitic stenosis of the vessels of the placenta and cord; some abnormality of the heart or great vessels; an early separation of the placenta, or an accidental hemorrhage, as in placenta prævia; also undue pressure upon the vessels of the cord, as in prolapse of that structure or when either extensive coiling, knotting, or torsion exists. *Maternal* causes are sudden death of the mother during parturition; grave organic disease resulting in weakness of the circulation, and thereby an imperfect exchange of fetal and maternal blood; and copious hemorrhage from any cause.

Respiration itself may be impeded by some anomaly of the respiratory tract whereby the entrance of air to the lungs is prevented. The asphyxia may follow a paralysis of the cerebral respiratory center from extreme compression of the fetal skull during an instrumental delivery or a tedious passage through a contracted parturient canal; or, finally, it may result from some mechanical obstruction to respiration, as when, a caul is present, or when, during premature attempts at respiration, some of the discharges of the parturient canal are sucked into the bronchial tubes. The latter cause is not infrequent during certain cases of dystocia, and these spasmodic respiratory efforts are often accompanied by a fetal cry, which, according as to whether it is heard while the fetus is still within the uterus or when it has descended to the vagina, has been termed the *vagitus uterinus vel vaginalis*.

The signs of impending death from asphyxiation during labor are a progressive weakening and slowing of the fetal heart-beats, as detected by auscultation; efforts at respiration while the fetus is still traversing the birth-canal; and the discharge of meconium, as evidenced by a staining of the amniotic fluid. The latter sign is considered by many

as indicative of an advanced stage of asphyxia. The appearance of the child varies. In the vast majority of cases its face is deeply congested, bluish or livid. This is described as the simple "blue," "cyanotic," or "apoplectic" variety, or *asphyxia neonatorum livida.* It is the more favorable variety, and denotes the minor degrees of asphyxiation. The discoloration is most marked in the face and upper portion of the body, gradually shading off into the natural flesh tints. The lips are swollen and protruding and the pupils dilated. Examination shows that the muscular tonus and the reflexes are preserved, while the heart-beats are moderately strong and regular, and the vessels of the umbilical cord are distended. Gasping respirations occur at irregular intervals. In the graver variety of the condition the surface of the child is pale and anemic, and the condition is then termed the "pale," "anemic," or "paralytic" variety, or *asphyxia neonatorum pallida.* Respiration now is altogether abolished; there is absolute loss of muscular tonus and the body-reflexes; the circulation is very feeble, and the heart-sounds irregular and indistinct; the vessels of the umbilical cord are generally collapsed; the features are placid, and the pupils widely dilated.

The *diagnosis* of asphyxia of the new-born child is plain. The *prognosis* is grave in the livid and very grave in the pale variety: it will depend entirely upon the degree of pulselessness as indicated by cardiac auscultation. As to the ultimate results of asphyxia neonatorum not much is known. This much can be said, however, that many of the children resuscitated at first develop eventually pulmonary, cardiac, and nervous manifestations, of which they die. Atelectasis, omphalorrhagia, paralysis, convulsions, and idiocy have all been noted as sequelæ of the condition, and it is not improbable that these symptoms may be directly traceable to some hemorrhagic effusion into the brain and spinal cord or pulmonary tissue.

The *treatment* includes prophylaxis as well as the restor-

ative measures. The prophylactic measures embrace the building up of both mother and fetus throughout pregnancy whenever there is reason to believe that a tendency to syphilis or other disease liable to result in fetal asphyxia exists; this may be accomplished mainly by the administration of arsenic, potassium chlorate, and the salts of iron and mercury. During labor every precaution must be taken to preserve the cord and vital centers from undue pressure. In the cyanotic variety of asphyxia, in which the pulsation in the funis is strong, increased congestion of the vital organs will be prevented by prompt ligation of the cord, after which measures of resuscitation may be instituted. In the pale variety it may be that some good will result from a delay in severing the funis, although as soon as placental separation is assured the cord must be ligated in order to prevent fetal loss of blood. After division of the cord oxygenation of the fetal blood must be promptly secured by the establishment of respiration. The less energetic measures may be first tried. These embrace suspension of the child by the feet in order to cleanse the bronchial tubes of all extraneous matter, when one or two blows with the hand or with a wet towel upon the buttocks or the back will generally suffice to start respiration. This failing, a little ether or whisky may be dropped upon the epigastrium of the child, or a quantity of cold water poured from a height upon the same spot, the rest of the body being immersed in warm water to avoid undue chilling. *Cooke's method* of the rapid introduction of the lubricated finger into the rectum may prove successful, but the possible danger of permanent rectal incontinence must be borne in mind. In the advanced stages of the cyanotic variety Bedford Brown claims excellent results from the hypodermic injection into both arms of 5 or 6 drops of brandy or whisky: this is useless in asphyxia pallida; the main objection to the method is the liability to the formation of an abscess at the site of injection.

Of the methods of artificial respiration that have been suggested those of Schultze, Dew, Laborde, and Prochownick are probably the best. *Schultze's method* (Figs. 160, 161) claims the largest number of adherents, and is undeniably very efficacious. It is performed as follows: The

FIG. 160.—Schultze's method of respiration : inspiration.

infant is grasped in such a manner that the thumb of each hand rests upon the anterior aspect of the thorax; the index finger enters the axilla from behind, and the remaining fingers extend along the dorsal aspect of the thorax. The child is thus suspended with its back to the operator. This is the position of inspiration, the thorax being fully distended, and the entire weight of the body resting upon

the index fingers in the axilla. The operator, slightly separating his legs, gently swings the infant upward until the body bends over at the loins, its weight thus being exerted upon the diaphragm, and thereby producing a forcible expiratory movement. This is the position of expiration,

FIG. 161.—Schultze's method of respiration: expiration.

the body now mainly resting upon the thumbs placed on the anterior aspect of the thorax. This maneuver may be repeated every few seconds until respiration is established. The main objection to the method is the danger of traumatism, as the rupture of some of the viscera of the abdomen or of the thorax, fracture of the ribs, dislocation of a vertebra, or undue strain upon the spinal cord.

In *Dew's method* the infant is grasped in the left hand in such a manner that the neck rests between the thumb and forefinger and the head hangs over in the position of full extension, thereby securing a wide opening of the epiglottis; the upper portion of the back and scapulæ rest in the palm of the hand, while the remaining fingers are inserted into the left axilla. The knees are then grasped by the right hand, the right knee resting between the thumb and forefinger, the left knee between the index and middle fingers, and the thighs in the palm of the hand. The right hand depresses the body to favor inspiration, while to secure expiration the movement is reversed and the child doubled upon itself, the thighs resting upon the abdomen and the knees and head being approximated. This movement may be repeated as often as required. *Rosenthal* modifies the foregoing methods in the following manner: The child resting upon a table with its neck supported by a roll, the feet are seized with the thumbs in contact with the soles, the index fingers with the back of the feet, and the ring finger resting upon the Achilles tendons: in regular order the knees, hip, and spine are bent so that the knees come in contact with the chest, thereby securing compression of the abdomen and full expiration; on extending the body inspiration follows. Compression of the larynx is thus avoided.

Recently *Laborde's method* of rhythmic tongue-traction has attracted considerable attention on account of its simplicity. It consists in seizing the tongue with catch-forceps or by the finger and thumb wrapped in a piece of cloth, and strongly drawing it out of the mouth, after which it is allowed to fall back into its normal position. This maneuver may be repeated about fifteen times in the minute. It is supposed to act by creating a reflex irritation of the respiratory center through the motions of the base of the tongue, transferred through the motor nerves (the superior laryngeal, the glossopharyngeal, the laryngeal, and the phrenic). Its efficacy is not yet confirmed.

Prochownick's method consists in suspension of the child by the feet with the left hand, the middle finger being passed between the ankles from behind forward, and the remaining fingers resting on the lateral aspects of the legs. The head barely rests upon some support, allowing full extension of the neck. The thorax is moderately compressed with the right hand until all mucus is expressed: the pressure is then relaxed and an inspiratory effort follows. This movement may be repeated six or eight times, after which the child should be immersed in a hot bath. Methods based upon the action of the pectoral muscles (Sylvester's, Pacini's, Forest's) are generally useless on account of the deficient development of these muscles.

Should efforts at artificial respiration by the foregoing methods fail, resort may be had to mouth-to-mouth insufflation or to the use of the tubes of Ribemont, Chaussier, or DePaul. In the *mouth-to-mouth insufflation* the child is laid on its back in a position of full extension, the chest resting upon a roll; a towel is placed over the infant's mouth, and the operator, taking a quick, full inspiration, applies his mouth to the towel and gently expires into the latter; compression of the chest is then secured by bending the head upon the thorax. In *catheterization of the larynx* care must be taken to introduce the tube into the larynx and not into the esophagus. This may be accomplished by passing the left index finger into the pharynx and locating the arytenoid cartilages; the tube is passed along the palmar surface of the finger, when it will readily glide into the glottis: if it be in proper position, the chest will expand; if it be in the esophagus, a gurgle will be heard and the abdomen will become inflated. The air will be expelled by the elasticity of the pulmonary tissues.

3. Traumatisms of the Infant.

(1) **Caput succedaneum** is an edema or serous infiltration of the soft tissues situated upon the presenting part of

the fetus. The degree of edema depends entirely upon the duration of the labor, and its situation varies with the presentation. Thus in the most common presentation—that of the vertex with the occiput anterior and to the left—the caput succedaneum is always found at or near the site of the anterior fontanel; in posterior occipital presentations it is often of considerable size and is situated over the posterior portion of the scalp; in brow presentations there is an immense edema and distention of the frontal region; and in difficult posterior chin presentations of the face the features may become almost unrecognizable from the amount of serous infiltration. In precipitatate labors there may be absolutely no exudation of serum. The explanation of the formation of the caput succedaneum lies in the complete absence of pressure upon that portion of the fetus corresponding to the orifice of the parturient canal, the rest of the body being subjected to tremendous muscular force. The condition need not excite apprehension: it will spontaneously disappear within three or four days after birth.

(2) **Cephalohematoma.**—Of very serious import is the condition known as *cephalohematoma*, or an exudation of blood at some point beneath the pericranium (Fig. 162). This is encountered about once in 200 to 300 cases of childbirth. It generally develops on the second or third day after a difficult labor, and is due to the pressure exerted upon the part by forceps or by the pelvic wall during the passage of the head. As would be expected, therefore, it is most commonly seen upon the lateral aspect of the head, and, being subpericranial, is confined to the bone or bones that have been injured, being limited by the dipping in of the pericranium at the

FIG. 162.—Cephalohematoma.

sutures. It is generally unilateral—over the parietal bone—but there may be an effusion upon both sides. Appearing at the time stated, the tumor rapidly increases in size: at first it is soft and elastic to the touch, but later, owing to the osteogenetic action of the elevated pericranium, small foci of ossification occur, and the tumor acquires a parchment-like feel, distinctly crepitating under pressure. Once developed, cephalohematoma may persist for one or two weeks. The tendency is to resolution or suppuration. *Diagnosis.*—There is but one condition—caput succedaneum—with which this tumor may be confounded, and that only on superficial investigation. The points of differentiation are—

Cephalohematoma.	*Caput Succedaneum.*
This is a bloody effusion beneath the pericranium.	This is a serous effusion in the epipericranial tissues.
Develops two or three days after birth.	Present at birth.
Usually localized at the sides of the head.	Always over the presenting part.
Generally due to pressure.	Due to lack of pressure.
At first soft and cystic to the touch; later crepitant.	Soft, non-fluctuating.
Persists for a week or two, and may suppurate.	Disappears in two or three days.

The *prognosis* is good. *Treatment*, if the tumor be small, consists in protecting the part or in the application of cold compresses to limit the amount of effusion. If suppuration occur, free incision must be practised, the pus evacuated, and the wound treated antiseptically.

(3) **Caput Obstipum.**—Wry-neck is occasionally noted after the extraction of the head in breech presentation, and in some cases of protracted posterior occipital presentation. In the former case it results from undue traction upon the cervical muscles, and in the latter from excessive rotation of the head upon the shoulders, which remain fixed in their original position. The condition generally disappears within a few days: in a limited number of cases, however, it remains permanently. But little can be done for it other than the application of emollient ointments.

(4) **Fractures.**—In every case of labor, with the exception of breech presentations, the cranial bones are more or less displaced by the pressure to which they are subjected during the passage of the head. As a result of this moulding of the head characteristic distortions have been recognized for the various presentations. In over-size of the head or under-size of the pelvis it may readily be conceived how the increased pressure may result in fracture of one or more of the bones. The occiput and the parietal bones are those most commonly involved, and the result is generally, though not necessarily, fatal. Should the fetus survive the injury, it must be treated on general principles, and cerebral compression avoided as far as practicable. Fractures of the long bones of the body are not extremely rare. Most commonly it is the humerus that suffers; next in frequency is the femur; then the tibia and fibula; and very rarely the clavicle. The fracture may partake of the nature of a separation of the epiphysis and diaphysis: it may be partial of the shaft (*greenstick fracture*), or there may be a complete fracture of the shaft. The arm is not infrequently broken during its extraction in a breech presentation: crossing of the limbs may be the cause, or there may exist an abnormal fragility, as in congenital rachitis. The *treatment* must be based upon general principles.

(5) **Perforations of the body** are most commonly the result of traction by the blunt hook, and are then found in the groin. In the careless application of the forceps to a breech one blade may be forced between the nates, and a severe or even complete laceration of the perineum result. Eyes have been gouged out by the careless introduction of the finger into the orbit during the delivery of the after-coming head, or by slipping of the forceps when a vicious grip upon the head had been obtained. If the fetus be not dead, the *treatment* must be based upon the principles of general surgery.

(6) **Paralyses.**—Paralysis of some one of the peripheral nerves may be noted after birth. Probably the most common form of paralysis in the infant is that of the facial nerve, resulting from pressure by an improperly applied forceps. Fortunately, this form gives a favorable prognosis, as the condition is very amenable to treatment in the form of faradism or the application of small blisters along the course of the nerve. Paralysis of the nerves of the brachial plexus may follow extraction of the shoulder or arms in head and breech presentations. The injury in this case may be slight, or permanent disability may result. The usual *treatment* is required.

4. Affections of the Respiratory System.

(1) **Atelectasis (congenital apneumatosis)** is a condition of non-inflation of the air-vesicles of one or both lungs, or only of a lobe or a portion of a lobe of one lung. The cause may be some mechanical obstruction to the entrance of the air into the affected portions, or the condition may result from some unknown cause. Complete atelectasis is necessarily fatal. In the partial variety there is more or less disturbance of respiration, which is shallow and rapid and associated with a certain degree of cyanosis; the cry is feeble, and the child does not appear to be well; there is no elevation of temperature. Physical examination will reveal dulness on percussion over the affected area. The *treatment* is that required for the moderate degree of asphyxia. If an entire lung be involved, it may be necessary to catheterize the larynx and gently inflate the collapsed tissue.

(2) **Catarrhal Pneumonia.**—It is within a comparatively recent period that pneumonia of the new-born child has been recognized as a distinct pathologic entity. It is now very generally admitted that many of the deaths formerly attributed to inanition, injuries during birth, and septic infection may be directly traced to an irritative pneumonia resulting from an imbibition of some of the maternal

or fetal discharges. Such an accident can occur only when premature attempts at respiration have been made, and inquiry will generally elicit a history of dystocia, the fetus having been retained for a considerable period in the lower birth-canal. Very rarely, if ever, does the disease develop from exposure at the time of birth. The symptoms appear in from twenty-four to forty-eight hours after birth. At this time the child, which has hitherto seemed absolutely well, becomes restless and irritable: it refuses to take the breast, constantly cries as if in pain, and gasps for breath, the respirations becoming very rapid, numbering as high as 100 to 120 per minute. The skin becomes dusky or even livid as a result of the nonoxygenation of the blood, and palpation reveals a heated, pungent condition. The thermometer introduced into the rectum shows a high temperature—103°–105° F. In many cases a cough develops, and this may become almost incessant. The strength rapidly fails, and death frequently follows in from three to four days. Should recovery take place, the entire illness will not cover over eight or nine days. The *diagnosis* is difficult, and can be determined only by the exclusion of sepsis of the cord and by attention to the history of the case. The *prognosis* is always grave. The *treatment* can be symptomatic only, and will be largely directed toward the sustenance of the patient's strength and the stimulation of respiration. Owing to the inability of the child to nurse, resort must be had to hourly feeding with freshly drawn maternal milk by a spoon or a medicine-dropper. To this may be added from one to five drops of brandy every hour, and for cardiac stimulation one drop of the tincture of digitalis every three or four hours, or oftener as required. A cotton jacket should be applied and respiratory stimulants administered in suitable quantities. Small doses of syrup of ipecac, containing from ⅛ to ½ grain of ammonium carbonate, may be administered three times daily, and, to relieve the pain, paregoric in 5- or 6-minim doses

may be exhibited at suitable intervals. The room must be kept warm, the atmosphere slightly moist, and draughts avoided. If there be much tendency to asphyxiation, the child may be placed for three or four minutes in a weak mustard-bath containing half an ounce of mustard to three or four gallons of hot water, 100° F. It should then be wrapped, without drying, in a warm blanket for thirty minutes, and further stimulation resorted to. As convalescence advances the usual course of systematic nursing must be resumed.

(3) **Coryza.**—Aside from the characteristic snuffles of congenital syphilis, the new-born babe very frequently exhibits all the manifestations of an acute coryza. This results from exposure at the daily bathing, from a draughty and improperly heated room, or from a lack of sufficient clothing. It may be corrected by attention to the foregoing details, and by insisting upon the wearing, day and night, of a linen cap to supplement the lack of hair.

5. Affections of the Digestive System.

(1) **Stomatitis.**—The mouth of the new-born baby is especially prone to the development of inflammatory conditions. Most common among these is the *aphthous* or *follicular stomatitis* (*aphthæ*), which is characterized by the formation on the lips, gums, tongue, and inner surface of the cheeks of small white vesicles or ulcers, associated with more or less elevation of temperature and symptoms of indigestion. The vesicular precedes the pustular stage. After ulceration the spots assume a grayish-yellow color and are surrounded by a distinct bright-red areola. The *treatment* consists in the use of ordinary weak honey of borax (5–10 grains to the ounce). *Bednar's aphthæ* is a very rare and very grave form of stomatitis encountered in cachectic infants, and characterized by the presence of two symmetrically placed oval ulcers on the hard palate near the velum, one on each side of the median line.

These ulcers resist all efforts at treatment and sooner or later involve the bony structure. The children almost invariably die of marasmus.

Parasitic stomatitis (*thrush*, *sprue*, *white mouth*), resulting from the presence of a specific fungus, the *saccharomyces albicans*, appears as pearly-white elevated patches, varying in size, situated on the tongue, lips, cheeks, or hard palate, and as a rule not inducing ulceration. Marked digestive symptoms may be present. The *treatment* comprises thorough cleansing of the mouth with hot water and a clean cloth and the application of a strong honey of borax (15 to 20 grains to the ounce). Very rarely a *gonorrheal stomatitis* may be encountered, associated with the presence on the lips and gums of pustules containing the gonococcus of Neisser. This form may be cured by cleansing with a weak mercuric-chlorid solution (1 : 7000 or 8000).

(2) **Vomiting** in infants is generally nothing more than the regurgitation consequent upon over-feeding, and, as such, its correction lies in a regulation of the time of nursing and the amount of milk ingested. It may indicate an abnormal amount of gastric irritability, due either to a pernicious quality of the mother's milk or to a lack of digestive power in the gastric juice. In all such cases a thorough chemical and physical examination of the milk must be made and a suitable pabulum administered. It may be that the administration of a small amount of lime-water before or after the nursing may correct the condition. If the digestive powers of the infant be deficient, ½- or 1-grain powders of saccharated pepsin may be administered three times daily, or small quantities of bismuth subnitrate dropped upon the tongue. In the case of bottle-fed children both the bottle and the milk must be well sterilized, or the milk entirely stopped and the child placed temporarily upon the well-known *albumin-water* (the white of an egg broken into a tumblerful of water), of which a few teaspoonfuls may be given every hour as required. Calomel $\frac{1}{12}$ grain and sugar-of-milk in small

powders, given every hour, may correct the trouble, or benzonaphthol (in 1- or 2-grain doses in powder form) may prove efficacious. Daily washing out of the stomach with boiled water may result beneficially in aggravated cases.

(3) **Colic** is always the result of indigestion, and attention to the laws laid down in the foregoing paragraph will often promptly result in a cure. It may be necessary to resort to the use of one or two drops of gin or brandy, a weak peppermint-water, or five or six drops of paregoric. The latter should never be used unless absolutely indicated.

(4) **Icterus Neonatorum (Pedicterus).**—On the first or second day after birth almost every infant will show a certain amount of jaundice, most marked on the face and the anterior aspect of the thorax. As a rule, this discoloration is very slight and will disappear in a day or two without any treatment. Occasionally the jaundice will become so intense as to excite apprehension. Usually it is hematogenic in origin, due to a rapid disintegration of the red blood-corpuscles after birth, with deposit of the coloring-matter in the tissues. In the graver forms the urine is heavily loaded with the bile-pigments. These cases are generally septic in origin and almost invariably prove fatal. For the milder cases all the treatment necessary will be the hourly administration of $\frac{1}{12}$ grain of calomel in 1 or 2 grains of sugar of milk. Nothing can be done for the septic cases.

(5) **Marasmus** is a term formerly much more employed than at present to indicate a progressive wasting of infants without any appreciable cause, and most commonly encountered in bottle-fed and immature children. Marasmic children are small, undersized, and wizened in appearance, with wrinkled, flabby, and yellowish skin: the emaciation becomes extreme and is associated with profound loss of strength. The condition is symptomatic rather than a disease in and of itself. It is associated with some grave systemic dyscrasia, as congenital syphilis, rachitis, or tuberculosis, or it results from poor hygienic surroundings or

ill feeding with corresponding digestive disturbances. *Seydel's* sign of marasmus is an atrophy of the thymus and inner thoracic glands. In order to correct the condition the primary cause must be ascertained, and the infant placed upon an appropriate course of treatment. If it be bottle-fed, a suitable pabulum must be provided, and blood-making and alterative remedies, as the syrup of the iodid of iron, mercury, arsenic, and cod-liver oil, administered in full doses. Daily inunctions of cod-liver oil are often beneficial. Change of air and careful regulation of the diet will frequently work a marvellous change in these infants, and if taken in time a large percentage of them may be saved.

(6) **Constipation.**—The intestinal torpidity of young infants often assumes serious proportions. If the usual dose of a dram or two of sweet oil or castor oil fails to have the desired effect, it is very seldom that small doses of the cordial of cascara sagrada or the small-sized glycerin suppositories will not induce a bowel-movement within twenty to thirty minutes: if these measures fail, a second suppository may be introduced, or an enema of 15 to 20 minims of glycerin in 1 dram of water given. The ordinary soap suppository may be tried in the milder cases. Should all these means fail, an enema of soap-suds, 1 or 2 ounces, will invariably have the desired effect. This should be administered gently through an absolutely clean soft-rubber catheter attached to a small glass funnel. If need be, this treatment may be repeated daily. Anal imperforation must always be looked for in these cases of constipation.

(7) **Diarrhea.**—The bowels of young infants respond very promptly, as a rule, to any indiscretion in diet, and if the weather be warm a troublesome form of diarrhea may develop. Prompt regulation of the diet and thorough sterilization of the food will generally effect a cure. If these measures fail, the bowels may be washed out with boiled water and the movements controlled by injections of starch-water and paregoric, 6–10 minims to the ounce, or by the

internal administration of paregoric and aromatic sulphuric acid in doses of 4 to 5 minims each, in a little water.

6. Affections of the Circulatory System.

(1) **The Hemorrhages of Infancy.**—(*a*) In a certain, though small, proportion of new-born children there will be encountered a puzzling and very annoying condition known commonly as *hemophilia* or *bleeder's disease*, or the *hemorrhagic diathesis*—an inherited tendency to bleed. This condition may not be suspected until some slight traumatism, as a scratch or a pin-prick, may occasion such an unwonted amount of bleeding as to attract attention or even excite alarm. As a rule, hemophilia rarely manifests itself before the end of the first year, although this is by no means a constant rule. The condition persists through life, such individuals being known as "bleeders." On inquiry there may often be found a strong family history of the same malady running through several generations. Hitherto the generally accepted belief has been that the hemorrhagic diathesis was transmitted through the females only, who never exhibited any of its clinical manifestations, to the males, who alone were subject to the hemorrhages, but who never transmitted the disease. To a certain extent this statement must now be modified. While the rule generally holds true, there have been reported a number of cases that prove conclusively that females may occasionally manifest the clinical peculiarities of the diathesis, and even perish in one of the profuse hemorrhages. As to the etiology of the affection absolutely nothing is known. In a number of the cases reported a strong specific taint existed, and in such cases a possible clue as to the proper course of treatment to be instituted is suggested. Generally all therapeutic efforts are useless.

(*b*) *Melæna neonatorum* is a hemorrhagic discharge from the stomach and bowels of the new-born infant, occurring usually during the first or second day of its life. It may

partake of the nature of a simple vomiting of blood, or there may occur the passage of tarry or bloody stools, or the two may be combined. If the amount of blood vomited be small and the discharge occur shortly after the child has nursed, it may be due entirely to an ingestion of blood from a chafed nipple, and this possible source of the hemorrhage must be investigated. The disease is commonest in male children. The *ctiology* of these gastrointestinal hemorrhages of the new-born is not yet fully understood. Without a doubt, in a certain proportion of cases they may be ascribed to the curious hemorrhagic diathesis, and in other cases to some local ulceration in the stomach or bowels. Other cases cannot be explained on these grounds, and the theory recently advanced by Preuschen seems to afford a very rational exposition of the etiology of the obscure disease. Recognizing the truth of the statement made by Schiff, that there exists a certain distinct relationship between cerebral lesions and gastric hemorrhages, Preuschen was led to investigate the possible etiologic relation existing between melæna neonatorum and injuries of the brain sustained during parturition, many of the cases of melena occurring after difficult labors. The results of his investigations seem to conclusively establish an intimate relationship between the two, but further observation will be necessary before a positive statement can be made. Townsend and Gärtner are inclined to attribute to the disease a specific infectious quality. Melena, according to Townsend, is self-limiting and of brief duration: the fatal cases terminate within a week; the others recover in from five to nine days. The *diagnosis* of the disease is plain; the *prognosis* is grave, fully 50 per cent. of the infants perishing. The *treatment* consists in the internal administration of astringents, as 1 or 2 grains of gallic acid hourly, the application of cold to the abdomen, and the hypodermic injection of ergotin. Persistent pressure over the abdomen answers most effectually in controlling the bleeding. The infant

must be kept warm, and, should collapse develop, alcoholic stimulation will be beneficial.

(*c*) *Omphalorrhagia.*—Hemorrhage from the umbilicus or the umbilical cord may be either primary or secondary. Primary hemorrhage results from loose ligature or laceration of the cord, and occurs immediately after birth. It is of trivial import, all that is required being a re-ligation of the stump in a proper manner. Secondary hemorrhage is much more serious, but, fortunately, is quite rare. It occurs either at the time of separation of the cord, on the third or fourth day, or shortly afterward, between the fifth and fifteenth days. An explanation of its occurrence at this time may be found in the manner in which coagulation takes place in the arteries of the cord. As soon as the ligature is applied a coagulum is formed in these vessels, and this clot progresses inwardly along the course of the hypogastric arteries. Should a portion of the coagulum be dragged out with the separating funis, or should the coagulability of the blood be deficient, the vessels may be left patulous, when of necessity a more or less profuse hemorrhage will result. Of all the cases of secondary umbilical hemorrhage thus far reported, two-thirds have occurred in male children. The hemorrhage is generally abrupt, without premonition, and may be quite profuse. In some cases a marked jaundice may precede the attack. The *prognosis* is always grave, from 75 to 90 per cent. of the infants perishing from exhaustion. *Treatment* consists in re-ligation of the stump if this be possible. In the slighter hemorrhages the application of a firm compress saturated with an astringent solution, as vinegar, tannic acid, or Monsel's solution, may suffice. In other cases it may become necessary to apply a permanent dressing of plaster of Paris, or even to transfix the abdominal wall with hare-lip pins above and below the umbilicus, and around these secure a figure-of-eight ligature. These pins may be removed in four or five days, and a simple iodoform or acetanilid dressing applied.

(*d*) *Vulvar or Vaginal Hemorrhage.*—A curious phenomenon occasionally noted (once in 1000 cases) is a slight discharge of blood from the vulvar orifice of an infant two to seven days after birth. In some cases the discharge assumes a marked periodicity, as in menstruation; in others the bleeding is of irregular occurrence; while in still a third class it occurs but once, and may be regarded as a mere incidence. It is generally believed that the source of the bleeding is the uterine mucosa. The *etiology* of the condition is unknown, although various theories have been suggested, notably a too early ligation of the cord—that is, before cessation of pulsation—and a too firm application of the binder, resulting in pelvic congestion. The *prognosis* is good. No *treatment* is required.

(2) **Œdema neonatorum** is a condition occasionally encountered in the new-born infant, and characterized by the presence in the cutaneous tissue, either locally or generally, of a serous exudate. The edema usually develops at or shortly after birth—on the third or fourth day—in the legs first, gradually spreading upward. The skin of the affected portion is of a livid or purplish color, of normal elasticity, and pits on pressure. If a crack or a fissure occur, a certain amount of serous oozing will follow. The body-temperature is slightly above normal. The condition is a symptom of cardiac, renal, or pulmonary disease, which may be detected on physical exploration. The *diagnosis* is not difficult; the *prognosis* is fatal. No satisfactory *treatment* can be indicated.

(3) **Cyanosis Neonatorum.**—Cyanosis in the new-born infant, as in other individuals, indicates some obstruction to the circulation or aëration of the blood. It is purely symptomatic, indicative of some organic disease. Most commonly this is to be found in the respiratory tract in the form of an atelectasis or pneumonia, or it may be due to some cardiac or vascular anomaly. The pressure of an enlarged thymus gland upon the trachea may be the dis-

turbing factor. The *treatment* consists in an eradication of the cause, if this be possible.

7. Affections of the Cutaneous System.

(1) **Strophulus (red gum)** is a form of miliaria occurring in infants, and resulting from overheating of the skin from too much clothing, or from irritation and rubbing during the cleansing of the child. It occurs as a dense eruption of small pin-head or pin-point papules, giving a characteristic blush to the affected parts. While causing much anxiety to the mother, it is a harmless condition and shortly fades away. *Treatment* consists in the avoidance of irritation in cleansing, the wearing of soft clothing, and the application of a bland ointment, as cold cream or vaselin.

(2) **Ritter's disease (dermatitis exfoliativa infantum vel neonatorum; keratolysis neonatorum)** is a rare acute disease of the skin of the new-born child, characterized by hyperemia with excessive exfoliation of the epidermis, accompanied at times by a vesicular or bullous formation, and by a high mortality. It is more common in male than in female children. The disease generally appears in the second week, and is very rare after the fourth or fifth week. At first apparently healthy, the infant suddenly develops an erythematous blush upon the face or buttocks, which soon becomes general; there is no fever, nor is there gastric disturbance. Exfoliation of the epidermis quickly follows, the cuticle falling off in large flakes. In a very short time a new epidermis is formed, and the entire process, occupying a week or two, may be unaccompanied by systemic manifestations. In many cases, however, there will develop complications, as diarrhea, pneumonia, or marasmus, and the child ultimately perishes of exhaustion or from loss of body-heat due to the removal of so much of the epidermis. Eczema and subcutaneous boils are occasionally noted as sequelæ. The *diagnosis* is not difficult; the *prognosis* is grave. *Treatment* consists in the application of emollient

ointments containing ichthyol, boric acid, or resorcin; protection of the surface with cotton; and the administration of good milk and tonics, with proper attention to hygiene.

(3) **Pemphigus neonatorum** is a rare acute specific skin-disease occurring at any time within the first six weeks of infant life, and characterized by the formation over the entire body, with the exception of the palms and soles, of vesicles and bullæ of varying size. There are no constitutional manifestations, and no *treatment* will be required. The disease is to be distinguished from syphilitic pemphigus by the noninvolvement of the hands and feet.

8. Ophthalmia (Blennorrhœa) Neonatorum (Purulent Ophthalmia).

By this term is meant a purulent inflammation of the conjunctiva of the infant, due to infection at birth by gonorrheal virus contained in the uterine and vaginal discharges. This is an exceedingly virulent form of ophthalmia, in many instances resulting in total loss of sight from perforation of the cornea and destruction of the superficial tissues. It has been claimed that over 40 per cent. of all cases of total blindness have originated in this disease. While direct infection with Neisser's gonococcus is the exciting cause of the disease, there would seem to exist in many cases some predisposing factors, as the strumous diathesis, poor hygienic surroundings, insufficient nourishment, and exposure to cold. One eye or both may be affected. The average period of incubation of the disease is from two to five days. The symptoms are at first a characteristic reddening and edema of the palpebræ, with agglutination of the lids. There quickly follows a profuse seropurulent, and finally a thick and purulent, yellowish or greenish-yellow, discharge. The disease at first is limited to the palpebral conjunctiva, but soon spreads to the conjunctiva of the eye and the cornea. An examination shows a bright-red and angry appearance of the eye, and in the later stages of

neglected cases a hazy condition, and finally ulceration and perforation of the cornea, with escape of a portion or the whole of the aqueous, and at times of the vitreous, humor, with collapse of the eyeball. In cases in which this does not occur, iritic adhesions, corneal opacities, and staphyloma are very common sequelæ. The child may or may not suffer pain: in many cases it seems to be absolutely free from suffering. As a rule, there are no systemic manifestations. The *diagnosis* of purulent ophthalmia is plain; the *prognosis* is grave. *Treatment* should be mainly prophylactic, and includes careful disinfection of the vagina, in suspected gonorrheal cases, before and during labor by frequent vaginal douches of mercuric chlorid (1 : 2000). As soon as the child is born *Credé's method* of prophylaxis should be practised. This consists in cleansing the eyes with warm sterilized water, followed by the instillation of a few drops of a 2 per cent. solution of silver nitrate. The eyes should be cleansed twice or thrice daily in this manner as long as any danger of the development of the disease exists. After the disease has appeared the cleansing must be done hourly with warm water, followed in alternate hours by mercuric chlorid (1 : 5000 or 8000) and a saturated solution of boric acid or potassium permanganate (1 : 1000). Twice daily an application of a 4 per cent. solution of silver nitrate should be made. If corneal ulceration result, some good may follow the use of a solution of quinin sulphate, 4 grains to the ounce, twice or thrice daily. The cloths used for cleansing the eyes should be of gauze or thin muslin well sterilized, and should be destroyed when once used. A small glass syringe may be used for douching the eyes. If but one eye be affected, the healthy eye should be protected from infection by a properly applied collodion dressing.

9. Mastitis.

Inflammation of the breasts of the infant occasionally follows efforts at evacuation of the fluid that exists in vary-

ing amounts in the mammæ of both sexes for two or three weeks after birth. Handling of the distended breasts during this time should be strictly forbidden, for fear of mammary abscess, which, because of the poor development of the pectoral muscles, might readily result in a septic pleuritis. As a rule, nothing should be done in the line of *treatment*, the colostrum disappearing spontaneously in a short time. Should the glands become inflamed, emollient applications, as lead-water and laudanum, a weak ichthyol ointment, or a lead-plaster, may be made, and on the first indication of the presence of pus it must be evacuated and the wound treated aseptically.

10. Convulsions.

Convulsive seizures in infants are of frequent occurrence, and, as a rule, are indicative of nothing more severe than gastrointestinal disturbance. When the spasm develops, the feet should be immersed in hot water (avoiding scalding), and the head kept cool by the application of moist cloths. An emetic of syrup of ipecac should be given, and the bowels emptied by an enema of warm salt-water containing a spoonful or two of sweet oil or 15 to 20 minims of glycerin. In severe cases it may become necessary to administer an enema of chloral hydrate in 2½ drams of water, or to control the spasm by inhalations of chloroform.

11. Septic Infection.

(*a*) General septic infection of the new-born infant has its origin, as a rule, in an improper management of the cord. For several reasons this, which should be regarded as a physiologic wound, is especially prone to septic infection: these reasons are the close proximity of the delicate peritoneum, with direct avenues of access to it; the presence of three large vessels, and of a large amount of decomposing or mummifying tissue in the remnant of the funis. Any error in the aseptic management of this wound

may very readily result in a localized sepsis followed by prompt systemic involvement. The symptoms of infection are an abrupt and high elevation of temperature, fretfulness and irritability of the child, and a refusal on its part to nurse. An examination of the umbilicus will reveal an angry appearance of that structure, which may be covered with a dirty greenish-white mass of diphtheric exudate. Should the deeper tissues of the umbilicus be involved in the process, a true *omphalitis* exists, and this will be characterized by an edema and induration of a large portion of the surrounding tissue of the abdominal wall, the entire inflamed area protruding in a conical manner, the apex of the cone being the angry umbilical ulcer.

(*b*) Occasionally the septic process will manifest itself as the rare condition known as *tetanus* (*trismus*) *neonatorum* (*trismus nascentium*), which is characterized by all the symptoms of tetanus in the adult. The child manifests an extreme degree of restlessness, refuses the nipple, cries constantly, and develops a progressively increasing rigidity of the jaws, and finally of all the voluntary muscles. There is but slight elevation of temperature. The nervous system of the infant is so strained that the slightest noise, as in speaking or walking, or the softest touch, will suffice to develop a spasm. As to the origin of this disease nothing very definite is known. It is most common among the offspring of the indigent and untidy, and especially in the colored race. It occurs irrespective of climatic influence.

(*c*) In very rare cases the sepsis manifests itself in the interesting forms known as Buhl's and Winckel's diseases. *Buhl's disease* is a grave variety of infantile sepsis characterized by profound jaundice, cyanosis, vomiting, diarrhea, and an acute fatty degeneration of all the viscera. It always terminates fatally. *Winckel's disease* is practically the same as the foregoing, with the addition of hemoglobinuria. A fatal termination is usual, but not invariable.

The *diagnosis* of infantile sepsis is not difficult. The *prog-*

nosis is very grave, from 75 to 90 per cent. of the children perishing. The *treatment* varies according to the form of the disease. When there is present a diphtheric exudate upon the umbilical ulcer, thorough cauterization and disinfection are imperative. This is best accomplished by a strong solution of mercuric chlorid (1 : 500), the silver-nitrate stick, and the application of the usual salicylic-acid dressing. Should suppuration occur, free incision is required with disinfection of the wound. Tetanus is best treated by the antitoxin of Tizzoni and Cattani, with hourly feeding by gavage, the milk containing one or two drops of brandy. One-grain acetanilid powders, three or four times daily, small doses of chloral and the bromids, and laxative and sedative enemata, may be of service.

12. Congenital Syphilis.

Syphilitic infection of the fetus may manifest itself before birth, and result in fetal death and a premature termination of the gestation. In other cases, though rarely, the child may manifest the disease at birth. The usual course is for the child to be born apparently free from the disease, strong and healthy-looking; or it may be scrawny and but poorly developed. At the expiration of four or five weeks the characteristic manifestations of the disease appear. These are primarily the "snuffles" or coryza, characterized by the constant flowing of an intensely acrid and irritating discharge, quickly followed by excoriation of the lips and nasal alæ. Shortly the cutaneous eruptions may be noted, assuming the form of roseola or the maculopapular syphilid over the entire body: with it may be a pemphigoid eruption, involving also the hands and the feet. On account of the mucous patches common around the mouth of the child, nursing from a noninfected wet-nurse should be forbidden. An examination of these syphilitic children shows them to be more or less marasmic, with temperature-fluctuations (without, as a rule, any high elevations), and

with enlargement of the liver, spleen, and other organs. Hemorrhages from the mucous surfaces are not rare, and the tendency in neglected cases is sooner or later to the development of bone-disease. The *diagnosis* of congenital syphilis is easy. The *prognosis* in nursing infants is excellent, but is very grave in bottle-fed infants and in those not placed under the best hygienic surroundings. The *treatment* must be energetic. It consists in the administration of mercurials, preferably in the form of the mild chlorid in doses of $\frac{1}{12}$ of a grain twice or thrice daily. If the stomach prove rebellious to this, the mercury may be given externally in the form of the blue ointment rubbed in on the binder. As required, cod-liver oil internally or by inunction should be exhibited, together with iron in the form of the syrup of the iodid. Under this course of treatment the improvement is generally prompt and permanent.

13. Congenital Defects.

(1) **Tongue-tie (ankyloglossia)** is a congenital shortening of the frenum of the tongue, causing more or less interference with nursing. *Treatment* consists in snipping the edge of the frenum with sharp-pointed scissors, avoiding too deep an incision for fear of wounding the artery of the frenum.

(2) **Hare-lip** is a congenital fissure of the lip due to arrested facial development. It may be single or double, slight or pronounced. If decided, it causes inability to nurse, and must be corrected a few days after birth by one of the recognized plastic operations.

(3) **Cleft palate** is a congenital splitting of the palate, hard or soft, usually associated with a similar defect of the upper lip. Because of the inability to nurse, some relief must be afforded to the child until it reaches an age suitable for operative interference. This is best secured by means of an artificial rubber palate attached to the nipple of the bottle from which the child is fed: this, fitting into

the roof of the mouth, completes that structure sufficiently to permit of suction. When the child is two or three years of age some form of plastic operation must be performed.

(4) **Supernumerary Digits.**—An extra number of digits, fingers or toes, is a not unusual occurrence. They are seldom fully developed, and are usually cartilaginous in structure. They should be removed at once after ligation.

(5) **Phimosis** is a congenital elongation and constriction of the prepuce with adherence of the mucosæ, whereby exposure of the glans penis is rendered impossible. If uncorrected, it is very liable to be followed by enuresis and a tendency to spasms and masturbation. When the child is about two weeks old, the condition should be treated by stretching and retracting the foreskin, at the same time with a blunt instrument separating the adhesions between the glans and the mucous surface. A few drops of sweet oil may then be applied. The stretching should be repeated every few days until the glans can be readily exposed. In some cases circumcision may be necessary.

(6) **Imperforate Rectum.**—In a limited number of cases the anal orifice will be absent. Usually a mere mucous diaphragm closes the opening, and this can be corrected by a crucial incision. In other instances there is an entire obliteration of the rectum for the space of an inch or more, and in these more serious cases it is necessary to resort to the formation of an artificial anus in the inguinal or lumbar region to give vent to the fecal accumulation. If at a subsequent operation a new rectum can be formed, the artificial anus may be closed and the fecal contents diverted into their proper channel.

(7) **Spina bifida (spinal meningocele, hydrorrachitis, or cleft spine)** is a congenital hernia of the spinal membranes through a cleft or abnormality, usually of the lower (lumbosacral) portion, of the vertebral column, containing more or less cerebrospinal fluid, and due to a deficiency of

the arches of one or more of the vertebræ (Fig. 163). It is very frequently associated with other congenital defects and intrauterine disease, as hydrocephalus. It appears as a fluctuating tumor of varying size, becoming more tense and expanded under voluntary muscular efforts such as accompany violent crying, and capable of being diminished by compression of the sac. Simple compression of the tumor, however, may induce spasms due to cerebral irritation and compression. Certain other congenital tumors of a less serious nature (lipoma, fibroma, or myxoma) may occupy a similar position, but these are rare, and are readily recognized, as a rule, by their peculiar characteristics. A distinguishing feature of cleft spine is the attachment of the cauda equina to the tumor, an area of indurated tissue marking its point of origin. The *prognosis* is grave: the child generally dies soon after birth from ulceration and rupture of the sac or from cerebral convulsions. A small proportion of cases are cured by proper operative procedure. *Treatment.*—Only when the tumor is large or manifests a tendency to increase in size is operative interference absolutely indicated; in the minor degrees protection by suitable shields will answer. It is better, however, to ensure safety from ulceration or injury, to puncture the sac (to one side of the median line to avoid injury of the cord), evacuate its contents, and apply compression by a soft pad; this may be repeated, if need be, after a few days, and again as required until the fluid is removed. Excision of the sac and closure of the wound by buried catgut sutures

FIG. 163.—Large meningocele and spina bifida (Hirst and Piersol).

have been suggested. *Morton's treatment* consists in the withdrawal of about a dram of the contained fluid, and the immediate slow injection of a dram of a solution containing iodin 10 grains and potassium iodid 30 grains in an ounce of glycerin. The pedicle of the sac is compressed during the injection to prevent entrance of the fluid into the spinal canal. The injection may have to be repeated from time to time before the sac is obliterated by the inflammatory action produced by the irritating fluid.

(8) **Umbilical Hernia (Exomphalos).**—Owing to the weakened condition of the abdominal wall at the site of the navel, intestinal protrusion at this point in the infant is not rare. Very commonly it is a trivial condition, consisting in the mere pouting of a small loop of intestine, and can be corrected by the application of a firm compress held in place by a tightly secured abdominal binder. In the graver cases, in which there exists a true exomphalos with deficient development of the part, some form of plastic operation is indicated to correct the condition. The *prognosis* in these cases is grave.

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